

LAND ECONOMICS

a quarterly journal of

PLANNING, HOUSING & PUBLIC UTILITIES

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NOVEMBER 1949

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Soil Conservation in the USSR

"Whether we are to live in peace with Russia, as we profoundly hope, or in strife, it is of utmost importance that we achieve a systematic and full understanding of Russian culture and history and of the habits, beliefs, motivations, fears and loyalties of the Russian people."

THIS provocative statement appears in the 1948 annual report of the Carnegie Corporation of New York and, along with it, the announcement of a grant of funds to Harvard University with which to set up a Russian Research Center for the period from February 1948 through June 1953.

The major objective of the Center is the study of Russian institutions and behavior in an effort to determine the mainsprings of the international actions and policy of the Soviet Union. The Center hopes to make a more general contribution to the scientific and scholarly understanding of the Soviet world and of the contributions of Russian science and to provide the public

with "carefully evaluated information in this area." One of the two main foci of interest of the Center is a study of the Russian economy and it was as a part of this study that a Soil Conservation Conference was held at Harvard University in January 1949. Soils scientists, geographers, and agricultural economists were in attendance. The papers delivered at the conference are informative and deserve a wide distribution for they present facts based on scientific research by scholars and they raise questions which have called forth differences of opinion. The principal papers are printed here along with brief comments made by speakers in the discussion period. (Editor)

The Conference was organized principally by Professor Alexander Gerschenkron and Professor Wassily Leontief, and the other participants were:

John D. Black, Professor of Economics, Harvard University. (Chairman)

Joseph J. Bulik, Agricultural Attache, American Embassy, Moscow, 1944-1948.

George B. Cressey, Professor of Geology and Geography, Syracuse University. Author of *Asia's Lands and Peoples* (1944) and *The Basis of Soviet Strength* (1945). Associate Editor, *Economic Geography*, Advisory Editor, *Far Eastern Quarterly*.

Naum Jasny, Agricultural economist. Known as the foremost expert on grains and

mechanical agriculture. Author of numerous publications in German, Russian and English, one of the most recent being *Socialized Agriculture USSR* (Stanford University). He is now working on a volume on Soviet Agriculture in World War II. At present he is with the Soviet Economics Study Group (Food Research Institute, Stanford University, Washington Office.)

Dey Ber Krimgold, Soil Conservationist, Soil Conservation Survey, U. S. Department of Agriculture. He has done extensive work in hydrology, rainfall records, soil runoff, etc. Has written memoranda on the "Fifteen Year Soil Conservation and Shelterbelt Plan of the USSR."

M. Y. Nuttonson, formerly senior agronomist with the Department of Agriculture in Washington, now working for the American

Institute of Crop Ecology. For three years he has been working on agricultural regions of the Soviet Union and their micro-ecological characteristics, estimating climatological changes and relating them to similar areas in the United States.

Solomon Schwarz, Lecturer on Russian Economics at the New School for Social Research. Regular contributor to the Russian *Socialist Courier*. Concerned also with labor and socialist movements in many countries. Author of *Management in Russian Industry and Agriculture* (with Bienstock and Yugow).

Derwent S. Whittlesey, Professor of Geography, Harvard University. Consultant to U. S. State, War and Navy Departments and to OSS during the war. Author: *The Earth and the State* (1939). Contributor to *Foundations of National Power* (1945).

USSR: The Geographic Base for Agricultural Planning

By GEORGE B. CRESSEY

WE do well to remind ourselves frequently of the tremendous size of the Soviet Union. Within its eight million square miles is room for all of the United States, plus all of Canada, plus Alaska, plus Mexico. Here is a country of truly continental proportions, with all that the word implies in terms of climate, inaccessibility, and outlook on the world.

It is also important to point out that the great water bodies of the USSR—the Black Sea, Caspian Sea, Aral Sea and Lake Baikal—lie in approximately the same latitude as our American Great Lakes. In other words, the bulk of the Soviet Union lies north of the United States-Canadian boundary. While many of the pioneer aspects of the Soviet Union today resemble developments in the United States following the close of the Civil War, we should recognize that here is an Asiatic Canada rather than an Asiatic replica of the United States. The analogy is not entirely perfect for the Rocky Mountains keep out Pacific maritime influence from western Canada.

No such mountains block Atlantic influence into Soviet lands, although the Alps and Scandinavian Highlands restrict the low-level path for Atlantic moisture en route to the Soviet Union to a scant four-hundred-mile opening.

The simplest analysis of environmental conditions is in the fourfold pattern of vegetation, with belts extending from east to west in roughly parallel fashion. In the far north is the tundra. To its south lies a vast coniferous forest, the taiga. Farther south are the steppes, and beyond them the desert. Except for marginal areas and the higher mountains, very little of the country receives more than twenty inches of rainfall, which is the minimum for dependable agriculture in the United States. Only the lower temperatures of the USSR and the lessened evaporation due to lower temperatures make agriculture possible. Soviet agriculture is carried on down to the fifteen-inch and even twelve-inch rainfall lines, but with increasing precariousness. It is a widespread climatic

principle that the lower the average annual precipitation the greater the variability from year to year. Recurrent crop failure is almost inevitable.

Within the eight million square miles of Soviet territory are vast areas which offer little as a home for large numbers of people. A few woodsmen may live in the forest or trappers in the tundra; mining communities may develop anywhere and herdsmen may find a living even in desert borderlands. But if millions of people are to find a livelihood there must be dependable agriculture. Too much of the Soviet Union is too cold or too hot, too dry or too wet, too mountainous or too hilly, too inaccessible or too infertile to be very attractive as a home for man. Much of the north has a frost-free growing season of less than three months. Much of the south has but five to ten inches of rain. Local conditions permit limited areas of agriculture, as around Yakutsk or the oases of Soviet Middle Asia. But these are merely islands in what must remain essentially an unpopulated area.

If we draw lines from Leningrad to Lake Baikal and back to Odessa we enclose a triangular or wedge-shaped area which includes nine-tenths of the good land in the Soviet Union. Here are the bulk of the farms, most of the cities, the larger part of the railroad mileage, the major industries, the population and the other things which count. It is well to point out that this triangular zone of agricultural land has two frontiers. To the north are the lands of cold into which cultivation advances at the peril of shorter and shorter growing seasons and the soils are excessively acid. On the south the agricultural frontier is one of drought. The soils are extremely fertile but, with the limited and uncertain rainfall, agriculture becomes exceedingly precarious.

The course of Russian history has seen the gradual extending of this triangle; the driving of the wedge farther and farther eastward into Asia with increasing pressure to the north and to the south. Further advances will occur but under the conditions of agricultural techniques now prevailing it seems doubtful whether the essential pattern of settlement will change materially. In fact, if more land is needed, as it certainly is, better results probably can be secured by the clearing of forest areas and the draining of swamps within the established triangle rather than in attempting to extend agriculture northward or southward. This agricultural zone covers about one-million square miles, of which only six-hundred thousand are actually under cultivation. In comparison, the United States with a much smaller population cultivates five-hundred-thousand square miles and could almost double that area if pressed. Conditions of soil, climate, and agricultural potential in North America are enormously superior to the resources of the Soviet Union. Even if agricultural developments in the United States should stand still it is doubtful whether the people of the Soviet Union could ever be fed as well as is now the case in the United States and Canada.

Man cannot change the basic factors of climate nor can he alter its many cycles. Precipitation is related to oceanic sources of moisture and the basic overall pattern of wind circulation as fixed by the sun and the distribution of land and ocean. Not even the disappearance of the Caspian Sea could materially affect Soviet climate. It is well to distinguish between what we may call macro-climate and micro-climate. While man cannot essentially modify the larger elements, he can do something to introduce changes in the micro-climate; thus the presence or absence of a forest cover

modifies soil temperatures. Cultivated fields give rise to different run-off regimes than that created when the land is blanketed by natural vegetation. Techniques of dry farming alter the accumulation of moisture in the soil. It is thus possible for Soviet scientists to introduce local and minor improvements in the micro-climate of limited areas.

If I have said almost nothing with regard to shelterbelt planting and other aspects of the proposed Soviet program, it is because I should like to stress the background against which they must be projected. The fact that large areas in the Ukraine and lower Volga regions are a steppe is due to the fact that rainfall and other climatic conditions are not favorable to trees. It is quite possible for man to introduce an artificial forest,

but there is no guaranty as to its success, nor any assurance that it will establish itself by natural reproduction. Young trees must be watered during the first years and are very susceptible to periods of excessive drought or unusual temperatures. The changes in wind velocity which the trees may produce eventually are limited to areas of a few hundred yards, and any turbulence which may result is entirely inadequate to lift the air sufficiently for the cooling which is needed for precipitation. In other words, the value of shelterbelt planting is limited to individual fields or parts thereof, and can have but negligible significance to an area as a whole. Probably the most which man can do to modify the general climatic picture of any area amounts to no more than two or three percent.

USSR: Conservation Plan for the Steppe and Timber-Steppe Regions

By DEY BER KRIMGOLD

IN announcing the grant to the Harvard University Russian Research Center in his 1948 report, President Dollard of the Carnegie Corporation of New York made the following statement:

"Whether we are to live in peace with Russia, as we profoundly hope, or in strife, it is of utmost importance that we achieve a systematic and full understanding of Russian culture and history and of the habits, beliefs, motivations, fears and loyalties of the Russian people. Without such understanding our best efforts either to create a stable world or to defend our own freedom will be futile."

The "Programs and Census of Current Projects," issued in January 1949 by the Russian Research Center, and this Conference on Russian Soil Conservation Policies of January 14 indicate that the Research Center correctly interprets the intent and purpose of the grant.

Economic conditions and major developments in principal industries, including agriculture, have a profound influence on the thinking, actions and reactions of people and leaders of any society. In a materialistic society such as exists in the Soviet Union this influence is most pronounced. Therefore, an undertaking as vast as the fifteen-year conservation plan promulgated in the decision of the Council of Ministers of the USSR and of the All-Union Communist Party of October 24, 1948, deserves careful study and consideration. Earnest students of Soviet life and therefore of Soviet economy cannot afford to dismiss this important program as "Bolshevik propaganda." Those who made the various "authoritative" estimates in 1941 that Germany will overrun the Soviet Union in from six weeks to three

months might well ponder the following passage in Stalin's February 10, 1946 speech announcing the postwar five-year plan:

"... It appears that the transformation of our country from an agrarian into an industrial country required only some 13 years. Thirteen years is an incredibly short time ... This explains why the publication of these figures ... roused disputes in the Foreign press. Friends called it a miracle. Foes declared the five-year plans were Bolshevik propaganda and inventions of the Cheka."

Our leaders in government, industry, agriculture and in other phases of our national life must be in possession of true facts and of unemotional appraisals and evaluations of facts. We must make sure that our estimates in the future are better than some of those made in 1941. In view of past experience it would seem more prudent to accept the published official information provisionally and subject it to close scrutiny than to summarily dismiss everything published in the Soviet Union as "Bolshevik propaganda."

To those unfamiliar with the relief, soils, and climate of the regions and with the basic concepts of the present political and scientific leadership in the Soviet Union, the announcement of the conservation plan for the Steppe and Timber-Steppe regions may have come as a great surprise. To the kolkhozy, to technical and scientific agricultural workers in the USSR, and to those here who know the regions involved and who have followed developments there and tried to understand the motivating reasons for these developments, the decision was only another milepost on a well-defined road. The postwar task of reconstruction tended to slow the pace of agricultural development attained during the third five-year plan, which was interrupted by the war. The goals of the

postwar five-year plan for these regions were in keeping with those of the rest of the economy. However, when the results of the drought of 1946 were properly appraised it was decided to accelerate the process and to give great prominence to this program.

The Steppe and Timber-Steppe regions are in many respects similar to the dry-subhumid and semi-arid regions of the northern United States. The "sukhovei"¹ and the greater proportion of snow are important differences which are often overlooked. However, with these and other differences clearly in mind, one might think of our dry-subhumid and semi-arid areas as a general frame of reference. Any student of our so-called dryland agriculture knows that with ordinary tillage and cropping practices, crop yields in such areas are anything but stable. Indeed the most specific agricultural characteristic of such areas is the high degree of correlation between crop yields and amounts and distribution of precipitation. We in the United States had crop failures and dust storms in the dry thirties and bumper crops and excellent forage in the wet forties.

The same is true in the corresponding regions of the USSR, but to a much greater degree, because dry years are far more frequent and the "sukhovei" far more devastating than the winds in our Northern Great Plains. In the last sixty-five years the lower Volga region (Povolzhie) experienced 22 droughts; the Voronezh, Rostov, Voroshilovgrad and Stalingrad oblasts had fifteen and the Bashkir, Tatar, and Mordov autonomous republics and the Kursk, Khar'kov, Dnepropetrovsk, Kherson, Niholayev, and Crimea oblasts were each stricken more than ten times.

¹A dry hot wind in the south and the southeast of the USSR, blowing mostly from the East and bringing about long and stable periods of drought.

The program of conservation and afforestation which we are trying to appraise is to be carried out in an area stretching from Magnitogorsk in the Urals to Kishinev in the west (about 1400 miles) and from Ryazan' in central Russia to Cherkessk in the south (about 800 miles) and comprising about 800,000 square miles. The Steppe and Timber-Steppe regions include practically all of the prewar area of the Ukraine and three autonomous republics (Tatar, Mordov and Bashkir), sixteen oblasts and the Krasnodar' and Stavropol provinces of the Russian FSSR (see tables facing map). These regions are the richest and the most densely populated in the Soviet Union. They include some of its most important industrial and manufacturing centers such as Kiev, Khar'kov, Tula, Voronezh, Saratov, Stalingrad, Rostov, Kuibishev, Kazan', Stalino, Voroshilovgrad, Dnepropetrovsk, Zaporozhye, Mariupol, Simferopol' and Taganrog. Within this area are: the Donbass coal deposits and the iron ore and manganese mining districts of Krivoi Rog and Nikopol; Dneprostroi, the greatest hydro-electric plant in Europe and the chemical and metallurgical industries associated with it; the entire or most important parts of the watersheds and navigable channels of the Volga, Dnepr, Don, Donets and Kuban' rivers.

In 1937 the part of the Ukrainian SSR included in the program was second only to the much larger Russian FSR in population and in economic importance. In the southern Ukraine are located the oldest and the most important coal and metallurgical centers as well as important machine building and chemical industries. The greatest sugar beet area in the Soviet Union and indeed in the world is located in the Ukraine (principally west of the Dniepr). At the same time the Ukraine is an important

grain and livestock-producing region with a corresponding food-processing industry. At the end of the second five-year plan (1937) the Ukraine accounted for more than 18% of the gross production of the entire Soviet Union including 54% of the coal, 61% of cast iron, 17% of the products of the metallurgical industry, 64% of refined sugar, 22% of wheat, etc. If to this is added the production of the sixteen oblasts, three autonomous republics and two provinces of the Russian FSR it can be readily seen that we are dealing here with the heart of the Soviet Union. Any major development in the most basic industry—the agriculture of this area—is bound to have an outstanding influence on the economic and therefore social conditions of the entire USSR.

Let us now consider the magnitude of the undertaking. The plan calls for the planting of trees on 15,200,000 acres including the eight government tree belts with a total length of 3300 miles (see map). The number of those and cost per acre depend on the type and purpose of the planting, the climatic and soil conditions and other factors. According to technical data on which were based the recently prepared recommendations for the Missouri Basin, the average cost of establishing an acre of shelterbelt is \$115.00 (1947 prices). An official of the Forest Influences Division of the U. S. Forest Service, from whom this information was obtained, considers 1200 plants per acre of shelterbelt to be a conservative figure. The surprisingly detailed information about the shelterbelts phase of the program published in the October 24 decision indicated that the plantings contemplated in the Soviet conservation plan differ little from those proposed for the Missouri Basin. With the much less favorable climatic conditions, much poorer transportation and communica-

tion facilities, and the more elaborate system of records involved in a planned economy, it is safe to assume that the Missouri Basin figure would be extremely conservative for the Soviet Union. With these figures we arrive at a total cost of \$17,500,000,000 and 18,250,000,000 pieces of planting stock. The Soviet Plan calls for nearly 34 billion pieces or 2200 per acre. These are impressive figures but the full magnitude of the program can be grasped only when it is realized that while the tree planting is a necessary and even indispensable part of the program it is by no means the most important or most significant part.

The introduction and establishment of cropland and meadowland rotations calling for perennial grasses and legumes about two years out of five on all of the crop land and about five years in seven on all of the meadow and pasture land of the 77,509 kolkhozy (collective farms) in the area, is an undertaking that in complexity, magnitude and economic implications far overshadows the vast tree planting program. According to the latest data (1938) the average landholding of the kolkhozy in the regions under consideration is about 3000 acres. Thus the introduction of grass rotations and the accompanying enormous task of farm planning, producing the required quantities of grass seed, rearranging field boundaries, constructing field roads and fences, procuring or producing enormous numbers of livestock to utilize the hay crops, building barns, milk sheds, dairies, etc., drilling or digging wells or building stock, is to be carried out on some 230,000,000 acres of land. This part of the program is scheduled to be completed in 1955, i.e., in six years. In the United States, with incomparably better facilities (roads, maps, etc.) and a much larger supply of trained technicians than are available in the USSR, plus large in-

centive payments to the farmers from the U. S. Treasury, the Soil Conservation Service with its soil conservation district program completed conservation planning on 148,000,000 acres and conservation treatment on 76,290,000 acres during the ten-year period of January 1938 to December 1947.

The figures for the United States and the USSR are not comparable. Our figures therefore cannot be used as a direct measure of the magnitude of the Soviet program; they do however give us a rough idea. In addition to tree planting and the introduction of crop rotation the plan also calls for the development of irrigation with local runoff water and the construction of 44,228 ponds and reservoirs. These phases of the program, although quite sizable in themselves and essential to the whole program, are minor in relation to the two major phases already discussed. That the central and local governmental units and the kolkhozy are in earnest about this program is evident from the reports of the Soviet press subsequent to the announcement of the program. These reports indicate that by the end of December (1948) 670,000 acres have been tilled on the kolkhozy and sovkhozy (state farms), so that the 1949 quota of shelterbelt planting may be completed in the spring of 1949. Twenty thousand labor squads have been organized to carry out the work. Government nurseries have prepared 1,870,000,000 pieces of planting stock. Seven thousand eight hundred tons of tree and shrub seed including 6,200 tons of acorns have been gathered. Eighteen thousand tons of perennial grass seed are in storage. Nine thousand people are to be given a one-month course in the introduction of crop rotations. Two-week tree planting training courses have been organized for 72,000 farmers. Nearly 300 tractors,



TABLE I—PLAN FOR PROTECTIVE FOREST PLANTINGS: 1949-1965 (USSR Protective Forest Belts)

Name of Belt	Area of Plantings	Length	Number of Belts	Width of Each Belt	Distance Between Belts
	<i>Acres</i>	<i>Miles</i>		<i>Feet</i>	<i>Feet</i>
1. Saratov-Astrakhan (on the banks of the Volga).....	44,500	560	2	320	.....
2. Penza-Ekaterinovka-Kamensk.....	20,000	370	3	197	.....
3. Kamishin-Stalingrad.....	8,150	105	3	197	984
4. Chapaevsk-Vladimirovka.....	37,800	360	4	197	984
5. Stalingrad-Stepnoi-Cherkesk.....	35,600	350	4	197	984
6. Vishnevaia Mt.-Caspian Sea (on the banks of the Ural River).....	102,800	670	6	197	656
7. Voronezh-Rostov (on the banks of the Don River).....	27,200	570	2	197	.....
8. Belgorod-Riv. Don (on the banks of the Sev. Donetsk River).....	7,400	310	2	99	.....
TOTAL.....	291,450	3,295	.....	.....	.....

TABLE II—USSR: FIELD-PROTECTING FOREST PLANTINGS (thousands of hectares)

Republics, Regions Provinces	All Types	Field Shelter Belts	Ravines and Gullies	Plantings on Sand	Forests	
					State	Coll Farm
Voronezh Province.....	387.2	243.8	49.5	37.0	41.9	15.0
Kursk Province.....	295.7	216.0	39.5	9.5	10.7	20.0
Orlov Province.....	250.2	159.5	49.7	5.3	19.7	10.0
Tamбов Province.....	162.1	99.9	30.7	13.6	14.7	3.0
Riassan Province.....	139.7	90.7	16.0	6.0	22.5	4.6
Tula Province.....	126.6	96.1	23.0	.....	2.6	4.7
Mordov ASSR*.....	108.8	66.1	18.0	4.0	15.9	2.0
Astrakhan Province.....	63.5	17.4	.....	40.5	3.2	2.4
Kuibishev Province.....	247.2	172.2	11.5	2.8	57.4	3.3
Saratov Province.....	369.1	318.6	6.5	14.5	26.4	3.1
Chkolov Province.....	329.4	280.3	2.0	1.0	43.5	2.6
Stalingrad Province.....	413.5	310.9	35.4	32.4	30.8	3.0
Bashkir Province*.....	267.6	164.0	30.0	2.0	63.2	6.4
Ul'ianov Province.....	108.2	41.1	5.0	2.0	56.7	3.4
Tatar ASSR*.....	223.4	178.2	13.0	3.0	24.7	4.5
Penza Province.....	133.6	93.4	6.0	4.0	27.6	2.4
Krasnodar Region.....	210.6	177.4	.....	.....	18.2	15.0
Rostov Province.....	452.1	314.9	2.5	19.0	98.6	10.5
Stavropol Region.....	265.9	200.9	3.2	13.7	34.1	14.0
Grozni Province.....	41.1	13.6	.....	20.0	6.9	0.6
Crimea Province.....	70.8	54.3	4.0	.....	12.5	.....
Ukrainian SSR*.....	1,364.6	861.6	30.5	91.2	331.3	50.0
TOTAL Thousand Hectares.....	6,031.0	4,172.5	366.0	322.0	960.5	190.0
TOTAL Thousand Acres.....	14,900	10,300	955	795	2,380	770

*ASSR—Autonomous Soviet Socialist Republic

SSR—Soviet Socialist Republic

2700 tree planting machines, 65 excavators, 141 graders and 108 bulldozers were earmarked for delivery by mid-summer 1949. It can be thus seen that we are dealing with an undertaking of first magnitude which will require a sizable proportion of the national effort. It also appears that the Soviet government and people are determined to complete the task within the allotted period.

Having arrived at some estimate of the size and scope of the undertaking we must naturally ask the following questions: (1) Why is the Soviet government undertaking this enormous task? (2) What is the program expected to accomplish? (3) What are the chances of the program succeeding? (4) What are likely to be the consequences of success? (5) What are likely to be the consequences of failure?

Partial answers to questions (1) and (2) are contained in the preamble to the decision published in the Soviet press on October 24, an abridged translation of which follows:

"The Council of Ministers and the Central Committee of the Communist Party recognize that the frequently recurring droughts and sukhoviy [dry winds] cause considerable damage to agriculture in the Steppe and Timber-Steppe regions of the European part of the USSR. At the same time science has proven and the experience of advanced kolkhozy and sovkhozy has confirmed that with proper practices there is every possibility to obtain high and stable crop yields and to create a stable forage and feed base for the development of livestock. To achieve this it is necessary beginning in 1949 to introduce the system of agriculture based on the teachings of the outstanding Russian agricultural scientists, V. V. Dokuchayev, P. A. Kostichev and V. R. Williams which includes: (a) Planting of protective forest belts on watershed divides, on field boundaries, on banks of ravines and gullies, on banks of rivers and lakes, and around ponds and reservoirs; also afforestation and stabilization of shifting sands. (b) Proper land planning and intro-

duction of cropland and meadow land rotations with perennial grasses and legumes and rational utilization of the various classes of land. (c) A proper system of tillage, proper crop management and widespread use of clean summer fallow, fall plowing, and early disking of stubble. (d) Proper system of application of organic and mineral fertilizers. (e) Use of certified seed, suitable to local conditions. (f) Development of irrigation utilizing local runoff by means of ponds and reservoirs.

"This system is a dependable means of combating droughts. It helps to increase the productivity of soils, to obtain high and stable crop yields, to stop washing and blowing of soil, to stabilize shifting sands, and it is conducive to proper land use. At the same time, this system makes it possible to develop a diversified agriculture with correct relationship among field crops, livestock and other branches and insures a significant increase in production.

"On the fields of the Dokuchayev Scientific Research Institute [formerly the Kamennaya Steppe Experiment Station] where this system of agriculture is most fully employed yields of grain were doubled and have reached an average of 20 to 25 centners per hectare [30 to 37 bushels per acre] in a short time. Even in the exceptionally dry year of 1946 the fields of this Institute yielded 25 bushels of winter wheat, 24 bushels of winter rye, 16 bushels of spring wheat and 44 bushels of oats per acre and 21 centners per acre of sunflower seed. At the same time the grain yields in the surrounding kolkhozy were $\frac{1}{2}$ to $\frac{1}{4}$ as much. The sovkhoz "Gigant" of the Rostov oblast where proper crop rotations have been followed and 1480 acres of shelterbelts were grown the average yield of winter wheat is over 37 bushels per acres. The kolkhozy of the Sal'sk district in the Rostov oblast with 6400 acres of shelterbelts, proper crop rotation and high level of cultural practices obtained in the drought year of 1946 an average grain yield of 20 bushels per acre. Individual kolkhozy in this district reached an average yield of 27 bushels. In the Stalingrad oblast the Kaganovich, Chapayev and the other kolkhozy served by the Deminski Machine-Tractor Station have been introducing proper crop rotation and have been planting shelterbelts. The grain yields per acre of these collective farms have exceeded by $4\frac{1}{2}$ to $7\frac{1}{2}$ bushels the yields of neighbor-

ing kolkhozy which have not adopted crop rotations and did not have shelterbelts."

The citing of these examples—representing a range from Kamennaya Steppe in the Voronezh oblast with about 20" annual rainfall to the Stalingrad oblast with 12"—is concluded with the following statement: "The experience gained in mastering this system of agriculture shows that it is generally attainable and highly effective."

These are the partial answers to our questions (1) and (2). The veracity of the yield data and the extent to which the examples are typical may have to be verified before they are fully accepted. The quoted statement does nevertheless represent the official views of the Soviet Government and of the Party.

Only those unencumbered with the knowledge of the physical factors involved might venture an offhand opinion as to whether or not this program will succeed. The various phases of this undertaking are based on recent research findings in the fields of soils, agronomy and of agricultural hydrology and climatology which as yet have not been applied widely enough to be reflected in general statistics of agricultural production. An adequate answer therefore can not be given without a study and analysis of these research findings. For instance, one question which is fundamental to the entire program is whether or not crop rotations with perennial grasses and legumes are likely to increase crop yields in areas with an annual rainfall of 300-400 mm (12 to 16 inches). Some published papers of the Saratov Institute of Grain Culture indicate that perennial grasses and legumes in such areas exhaust the moisture of the soil to such an extent and to such depth that more than one year of precipitation is required to replenish it. The Soviet government and the proponents of the

Dokuchayev-Kostichev-Williams system counter this contention with such results as were obtained in 1946 in the Stalingrad oblast and explain that if the sod is plowed at the right time in the fall of the year, and the snow is properly distributed and conserved in the winter and the proper crop is planted in the following spring, the results are satisfactory.

A closely-related question is whether survival of trees planted under such and even more severe conditions will be sufficiently high to make the tree belts and shelterbelts practical in these areas where they are needed most. To answer these most important questions one must have complete knowledge of the soils, their depth, infiltration capacities, moisture-holding capacities, state of aggregation and stability of aggregates; one must know not only the annual precipitation, but also its character, distribution, intensity and above all its probability of occurrence; one must also have a knowledge of wind movement, temperature and humidities and of the resulting evaporation. Most recent research data which have so far received only very limited distribution even among practicing agronomists show that grasses and legumes greatly improve the structure of the soil and therefore its infiltration and moisture-holding capacities. An answer therefore may be gained largely from a study of the probabilities of occurrence of precipitation and of the other climatic factors. It is clear that no intelligent estimate can be made at this moment as to whether and to what extent the program will succeed. It is, however, possible to suggest what studies should be made to arrive at satisfactory answers to our questions (3) and (4).

Programs of such nature as we are dealing with here are not undertaken on the spur of the moment. Certainly not in the Soviet Union where, contrary to popular

belief, undertakings of such importance are carefully and intensively studied over long periods of time before decisions are made. There is indeed an enormous amount of experimental work and a huge literature on every phase of this program. The literature on tree planting and shelterbelts in this area dates back to 1837. Dokuchayev lived and worked between 1846 and 1903. Kostichev lived between 1845 and 1895; the fifth edition of his lectures on combatting droughts was published in 1911. Williams, who died in 1939, reached the height of his scientific career before 1920. The answers to our questions lie in this large literature particularly in the works of Williams and in the analysis of results of experimental work in pertinent fields in the Soviet Union, in the United States and elsewhere. A surprising amount of pertinent technical information is contained in the published plan.

Such studies and analyses must of necessity be made by people competent in the fields of soils, agronomy, and of agricultural hydrology and climatology. However, best results will be obtained if even these physical studies are made in close collaboration with and under the guidance of social scientists capable of proper appraisal of the economic and social significance of the physical facts discovered by the physical scientists. The following paragraphs will serve to illustrate how closely interrelated physical facts—and their economic and social consequences—are with the political thinking of the leadership of the Soviet Union.

We have already shown that the conservation program of the USSR cannot be appraised properly without adequate knowledge of the physical as well as economic factors involved. To understand the more basic underlying reasons for the program, to be able to foretell the direction it will take, and to appraise it

in relation to other phases of Soviet life, we must know in addition the basic ideological concepts and philosophy of the political and scientific leadership of the USSR.

As a physical scientist I must ask your indulgence when I attempt to outline what appears to me to be the pertinent ideological concepts of the Soviet leadership.

Concept No. 1. In the view of the Communist Party, abundance (sufficient goods and services to meet everyone's needs)—the prime prerequisites of communism—can be achieved only in a planned economy. If this ultimate goal is to be achieved rapidly and if a planned economy is to function properly, production in all branches of the economy must be at the highest possible level—and what is equally important—it must be predictable and controllable. It therefore follows that everything possible must be done to eliminate or drastically reduce the wide fluctuations in crop yields in the the most important agricultural areas.

Concept No. 2. The political and scientific leaders of the USSR believe that man is a geological force capable of controlling and modifying his natural environment. This concept is frequently ascribed to Lenin. However, Vernadski and Williams, and before them Voeikov, Dokuchayev, Kostichev, Ismailski, and others in agriculture have boldly set out to change the natural environments. Voeikov and Dokuchayev believed and openly proclaimed in the last century that man can do something about the weather, and the latter proceeded to prove it by establishing the now famous forests and shelterbelts on the Kamenaya Steppe Experiment Station (recently renamed the Dokuchayev Scientific Institute of Agriculture) and elsewhere. Taking his cue from Dokuchayev, Kostichev, Temiryazev, Pasteur, Schles-

sing, Schumacher, and Wolny, Mr. Williams, in his lifelong studies of soils and grasses, developed the "dynamic" concept of soil formation. In his view, soil formation is a continuous process in which podzol, chernozem, solonets, and bogs are only individual stages. He found that the most desirable agricultural soils (chernozem and prairie soils) are formed under a cover of certain perennial grasses and legumes. Furthermore, he was able to explain the mechanism of the natural process and to demonstrate, at least to the satisfaction of the leaders of the USSR, that with proper understanding of the natural processes man can effectively modify and direct them to his benefit.

The political leadership, thoroughly committed to the teachings of Lenin, was more than ready to accept Williams' theses and enthusiastically sponsored a vast amount of experimental work and of practical tests which by and large supported Williams' views and his "systems of agriculture." The results obtained at Kamennaya Steppe and elsewhere, particularly during the 1946 drought, were accepted as conclusive proof that the earth and nature can be reformed. Michurin, who, in the eyes of the leadership of the USSR, is second only to Darwin in the field of biology, said, "We cannot wait for favors from Nature—our task is to take them from her." Therefore, the Soviet leaders concluded, the principal obstacle to a planned economy—widely fluctuating crop yields and frequent crop failures—can be overcome.

Concept No. 3. The function of agriculture is to convert the kinetic energy of the sun into human food, and a number of other products such as fibers for clothing, hides for footwear, and materials for shelter and fuel. This, in the view of Soviet political and scientific

leadership, can be accomplished only by plants grown on the land. Land is thus the principal means of agricultural production. Agriculture must have the highest priority on the use of land. Therefore, all talk about "natural balance" and retiring land from production to achieve such balance is sheer nonsense in the opinion of Soviet leaders.

Concept No. 4. Land as a means of production is unique in that with proper use it not only does not deteriorate but, on the contrary, is progressively improving. This concept is credited to Karl Marx and is axiomatic as far as the leadership of the USSR is concerned. Williams' graphical presentation of Wolny's experiments, showing undiminished rate of increase in yields with increasing amounts of light, water, and plant food, is universally quoted in practical and scientific literature throughout the USSR. The Soviet leaders are convinced that the Dokuchayev-Kostichev-Williams system of agriculture insures a maximum of water and plant food which are the limiting factors. Therefore they conclude that the greatest possible effort necessary to introduce this system is fully justified from the standpoint of the national economy.

Concept No. 5. The Soviet leaders accept the thesis that agriculture carried out in accordance with the Dokuchayev-Kostichev-Williams system and the tree belts along river channels and on watershed divides improves the water regimen and the climate. The question of the effect of land uses on streamflow, ground water, and on climate has been under constant debate the world over for a good many years. As regards streamflow, we in the United States have been interested more in flood flows, while in the Soviet Union they are much concerned with minimum flows to maintain navigation.

In spite of the fact that the effect of

land use on floods has been officially recognized by an Act of Congress in this country, and notwithstanding the decision of the Council of Ministers of the USSR, some hydrologists in both countries remain rather skeptical. Most hydrologists, climatologists, and even some foresters in the United States and elsewhere reject the idea that vegetation, including forests, has any appreciable effect on climate generally and on precipitation particularly. Most (not all) Soviet scientists conclude from data obtained at Kamennaya Steppe and elsewhere that grass cover, cropping, and tillage practices, and particularly trees in forests and forest belts, have a decided effect on wind velocity, temperature, humidity, and precipitation. Tannehill, in his book, *Drought, Its Causes and Effects* (1947) and Hursh, in *Local Climate in the Copper Basin as Modified by the Removal of Vegetation* (1948) appear to support the Soviet view. One Soviet worker cites data from Kamennaya Steppe, showing

greater precipitation in three belts than in the open steppes for all months of the year except June and July. His explanation fits well with commonly accepted ideas about formation of precipitation. Williams' views on the role of trees in the disposal of precipitation, and on their location on the elements of natural relief appear to be hydrologically sound and are supported by experience in the Soviet Union and elsewhere.

There are other basic concepts which must be recognized and understood, for instance, the Soviet concept of geographic distribution of industry, including the production and processing of agricultural crops and of forest products. Even the ideological concepts underlying the recent extremely important developments in Soviet biology and in science and technology generally cannot be fully understood without some knowledge of the sciences involved and of the history of science and technology in Russia from Lomonosov to the present day.

USSR: Some Physical and Agricultural Characteristics of the Drought Area and its Climatic Analogues in the United States

By M. Y. NUTTONSON

ON October 24, 1948, a Soviet decree was issued in reference to drought prevention and soil-water conservation practices for the greater part of the European USSR. The practices to be employed call for the establishment and development during the period of 1949 and 1954 of a huge system of shelterbelts, windbreaks, grassland agriculture, sound crop-rotation systems, proper land management and land utilization, the building of ponds and water reservoirs, etc. All these individual practices are interdependent and are to be looked upon as a

part of a highly complex agricultural program designed to permit a more stable and sound development of diversified farming and animal husbandry within the steppe and forest-steppe regions which cover a territory of about 780,000 square miles with a total population of nearly 76,000,000 people. This huge territory represents the most valuable grain production area of the USSR and includes the basin of the Ural River, the Volga Region, the Northern Caucasus, the Ukraine, and a considerable part of the Central Chernozem region.

Droughts have occurred in Russia throughout the greater part of its recorded agricultural history. The very first records date back to the 11th Century. In the course of centuries droughts with the crop failures and the starvation and death that follow in their wake are often forgotten. These, however, are often mentioned and can be found in the records of Old Russia. On the basis of detailed statistical material and a wide netting of meteorological observations during the past fifty years it appears that the regions most affected are the Central and Lower Volga and this situation decreases as one proceeds north or west. The droughts are usually the direct result of strong, dry and hot winds that blow from across the Caspian Sea region in the east. These drought-causing, dry winds occasionally spread out far to the north and west of the basins of the Volga and Ural rivers into the Tartar and Bashkir ASSR into the Central Chernozem area (mainly the Voronezh region), into the Ukraine (mainly into its left-bank regions), and into the North Caucasus (Krasnodar and Ordzhonikidze regions). Most often the droughts observed occurred during May, somewhat less often during April and June, while during the other summer months the frequency of drought has been rather low.

The causes of these dry winds in the European part of the USSR are believed to be related to the formation of dry air masses in the Arctic. From there they are believed to follow the western path of Siberia and Kazakhstan in the process of which they warm up and assume the basic characteristics of the dry, hot winds, which bring high temperature and low humidity into the European part of the USSR. During these drought-causing, dry winds the humidity of the air in the European steppes of the USSR often falls below 20 per cent (and considerably

lower in some cases). The velocity of wind fluctuates there from about 5 to nearly 30 miles per hour, at which time it raises clouds of dust and blows off the top soil from unprotected land of insufficient vegetative cover. The weather conditions during the dry wind are usually characterized by cloudless sky, haze, variable but high temperature of the air (from 77° to 104° F.) and, what is especially typical, a low relative humidity not only during the day but also during the night, accompanied by high night temperature.

With due consideration to local and regional variations, some of the major agro-climatic features of the whole steppe and forest-steppe area strongly suggest a similarity to the main agro-climatic characteristics of the Northern Great Plains of the United States, also to that prevailing in the Canadian Prairies during the growing period. As in the case of the American Great Plains and Canadian Prairies, prolonged droughts accompanied by strong dry winds have intermittently harassed the rural population and made agriculture insecure in the European steppe and forest-steppe regions of the USSR. The weather of the European steppes of the USSR, like that of the Great Plains of the United States, is unpredictable. Rain may come when needed, or dry hot winds may take the place of a sorely needed rain. There may be precipitation sufficient to produce a crop most years, but it does not always fall at the right time. Some years there may be very little or almost no rain. Common to both the USSR steppe region of Europe and the Great Plains of the United States is the fairly certain probability that sooner or later there will be another long drought. One cannot tell when it will come; it may come next spring or may not for a decade or two. Likewise, one cannot tell how long a

drought will last, as it may not rain for months or the rain may be insufficient to insure the production of a crop.

The injurious effects of these drought-causing winds on plants are due to insufficient moisture of the soil. If the temperature during these dry winds does not reach a height which is injurious to the plant tissues, the dry atmosphere alone is not too dangerous when sufficient soil moisture is available. Depending on the intensity and duration of drought its effect may disappear without any trace or may affect more or less seriously the yield and sometimes may also cause the complete loss of plants. The frequency of drought in various localities depends upon climatic conditions, but the very beginning of drought is determined by the weather condition of a given year.

For centuries droughts have been known to occur in the steppes of the European USSR and the Great Plains of the United States. Short-duration droughts may occur quite often but they usually do not cause severe damage. It is the long drought of infrequent occurrence which does the most harm. When it comes it ruins the growing crop and severely damages much of the land by blowing off the top soil of the fields; the result is economic disaster. To a certain degree this is equally true of the European Russian steppes and of the American Great Plains. In both, such prolonged droughts leave disaster, ruin and food scarcity in their wake.

Although the drought and soil erosion hazards can hardly be eliminated entirely, any practices that aim to ameliorate them and temper their devastating effects are of very great interest to agriculture. Drought and strong, dry winds do not always cause dust storms. It takes loose dirt to make dust. Soil that is protected with a good ground cover will not blow away and will not wash easily;

neither will the soil that retains its original structure and is bound together with organic matter and crop residues. A great number of sound soil conservation and soil-building practices to alleviate the problem of dust storms and soil erosion have been incorporated in the recently issued agricultural program for the European steppes and forest-steppes of the USSR. Most of these practices, such as afforestation, large-scale development of grassland agriculture, various crop rotation systems, contour farming, strip crops, terracing, etc., are in their essence very similar to the basic practices recommended and utilized by the United States Soil Conservation Service for the purpose of prevention of soil erosion.

Water is the lifeblood of drought-ridden agricultural regions. No practical way has been found yet to increase the amount of natural precipitation or to control the distribution pattern. However, from the crop production viewpoint, the most important thing is not so much the amount of precipitation that falls as the amount of water that soaks into the ground and is stored and kept there for future plant use. Therefore, the methods of drought control have two objectives: to increase the soil moisture reserve and to decrease the unproductive loss of the moisture content of the soil.

Field practices conducive to the increase of the moisture content of the soil include a great many of the various water-soil conservation practices designed to decrease or to stop the surface runoff of rain and melting snow and to increase the water-permeability of the soil. Contour furrows, contour tillage and strip cropping will slow down runoff and permit more water to soak into the ground. Tree shelterbelts, by catching drifts of snow, permit more of the water of the melting snow to be stored in the

ground. Permanent close-growing and deeply rooted grasses improve the water permeability of the soil. Land utilization and the selection of crops for various sites on the basis of topography, physical characteristics of the soil and the climatic environment can be conducive to the increase in moisture content of the soil. The loss of soil moisture is due largely to evaporation; hence, any method that is instrumental in decreasing evaporation from the surface of the soil is highly important. Properly planted and spaced shelterbelts and windbreaks that weaken the forces of the wind and slow down its velocity are one of the effective means of cutting down evaporation. Various field practices which control weed growth and maintain a mulch-like condition over the surface of the soil through trashy tillage (stubble mulch) or summer fallow, etc., will check evaporation as well as permit more water to infiltrate the ground. All the above-enumerated measures for stopping the runoff and checking the unproductive loss of soil moisture form a part of the drought control program recently adopted for the European agricultural regions of the USSR. These measures are also part of the standard agronomic and water and soil conservation practices of a great many areas of the United States.

A study of the agricultural-ecological characteristics of the whole territory of the European USSR under consideration, and the evaluation and analysis of the experimental, physical and biological data that have led to the formulation of the program for drought and soil erosion control, suggest that the environmental conditions of the various areas of the territory involved as well as their experimental data are too diverse to permit too broad a generalization. Broad generalizations as to the environmental conditions and the experimental data for the whole

of the proposed shelterbelt region of the European USSR will not lead to a sound and rational evaluation of the significance and the feasibility of this program. They are apt to mislead us greatly both as to the technical and experimental background of the field practices recommended in the program and as to the probability of its success or failure.

We find throughout the territory of the European USSR a very great network of agricultural experimental stations, substations and experimental fields and plots. A large amount of experimental data and observations has been published there as to the most useful plant material and the most effective field practices to combat drought, soil erosion, and water runoff. Much of these highly valid and basic experimental data were published as a result of the work of such great Russian agricultural scientists as Dokuchayev, Izmail'skiy, Timiryazev, Williams, and others.

Much of this work dates back to the end of the 19th century. A great amount of practical agricultural experience, highly important in its implications, has been gathered in the Russian steppe and forest-steppe regions in the course of the last two hundred years as a result of man's effort to survive and improve his lot and also as a result of his innate ability to observe natural phenomena. Thus, for example, the history of fairly successful forest planting in the Russian steppes goes back more than two hundred years when oak forest culture was started there to provide lumber for the ship-building needs of Peter the Great. This is especially interesting in the light of the 1935 American Shelterbelt Project in the prairie states, which has been a success but which aroused so much controversy at the time of its initiation. There were persons who prophesied failure at that

time and denied that trees could be made to grow on desolate prairies.

An indiscriminate study of the great wealth of technical, agricultural data of the Russian steppe and forest-steppe regions of Europe is apt to lead to confusion as the data and recommendations of one experimental station are often contradictory to some of the data and recommendations of other stations. Each source area of such data must therefore be viewed in the light of the concrete ecological setting and background of the locality and area from which these data were obtained.

To demonstrate more clearly the highly diverse ecological background of the various regions and areas involved, I have prepared a preliminary study of the European part of the USSR under consideration. The meteorological data of about sixty localities of that area have been studied and analyzed. The data analyzed included the mean, maxima, and minima monthly and annual temperatures, the dates of the last killing frost in spring and first in fall, the frostless periods, the average monthly, seasonal and yearly distribution, intensity, and amounts of precipitation, the precipitation-evaporation ratios and the precipitation effectivity indices, the average monthly, seasonal and annual relative humidity of the atmosphere, and the nature, characteristics, frequency and velocity of winds. These data were studied in the light of similar data within the United States and an attempt was made to ascertain and to formulate their United States micro-climatic (but not latitudinal) counterparts or analogues. For each of the sixty USSR localities studied a micro-climatic counterpart within the United States has been recorded in this preliminary study. On the basis of that study we find that in terms of United States' micro-climatic

analogues the range of climatic conditions within the drought belt of the European part of the USSR varies as widely as that found throughout much of the area of Montana, North Dakota, Minnesota, South Dakota, Nebraska, Wyoming and Colorado. From the viewpoint of one who is familiar with the geographical and agricultural regions of the United States the range of the climatic conditions within the European part of the USSR becomes somewhat more obvious and concrete through the use of this approach.

It is thus that one finds the larger part of the proposed shelterbelt area of the European USSR to be largely analogous to the Northern Great Plains Region of the United States. It is interesting to notice in this connection that while the density of rural population in that part of the European USSR ranges from 28 to 115 and averages about 67 persons per square mile, the density of the total population in the ecologically comparable area of the Northern Great Plains of the United States ranges from 3 to 16 and averages only 9 persons per square mile. It should also be noted that within the United States one finds many agricultural regions ecologically more favorable for grain production than those of the Northern Great Plains. This condition is not true in the case of the Soviet Union where the ecological counterpart of the Northern Great Plains represents that country's best natural grain production region. The population pressure of that European steppe and forest-steppe area and the lack of more favorable grain production areas in the USSR may provide at least some of the explanations as to the background of the tremendous scale of the drought and soil erosion control program and as to the urgency and importance attached to it by the Soviet government.

The search for physically and biologically sound land management practices which would permit production of crops best adapted to the land on a permanent basis, and increase its carrying capacity, is rather universal throughout most of the agriculturally progressive countries. Much experience, an innate ability to observe and make deductions, as well as thorough scientific studies and research are required to solve some of the complex problems inherent in man's effort to establish and maintain a sound agricultural system. The practical agricultural problems are so similar in areas of similar

physical environments that the pulling together of the experience and knowledge of the various areas and regions subject to similar agro-ecological conditions could lead only to the mutual benefit of all concerned. A detailed study of the agro-ecology of the various regions and areas of the European steppes and forest-steppes of the USSR in conjunction with their agricultural practices, plant material, and agricultural research data could be, among other things, a great contribution to the ecologically comparable micro-geographical areas of the United States.

USSR: Law on Measures to Ensure High and Stable Yields in the Steppe and Forest-Steppe Regions

By NAUM JASNY

LAND not actually used as arable but which could be used for this purpose without considerable outlay was, by and large, exhausted in Russia around 1910. The further expansion of the land in crops other than natural hay by twenty to twenty-five million hectares until 1940 (pre-1939 territory) occurred mainly by: (1) plowing up submarginal land, (2) plowing up of partly indispensable meadows and pastures, (3) reducing fallow, partly below the amount justified by climatic conditions and technical level in agriculture, and (4) to a small extent, by land improvement (artificial irrigation and the clearing of cut-over land). The goal of the third Five-Year Plan to expand moderately the cropped plowland proved a complete failure and the respective goal of the fourth Five-Year Plan is more modest than that of the third Plan.

Three main groups of land now used as arable can be distinguished: (1) irrigable; (2) land receiving sufficient precipitation (more than 20" annual pre-

cipitation at about 50° of latitude); and (3) land not receiving sufficient precipitation.

Artificially-Irrigated Land

Irrigated cropped plowland was estimated at 6,167,000 hectares in 1938, of which 4,198,000 hectares were in Central Asia. Adjacent Kazakhstan, South Caucasus, mainly Azerbaidzhan, had 1,081,000 hectares of such land. In all other areas only 888,000 hectares were irrigated; part of this land was in North Caucasus. There are limited possibilities of expanding the irrigated land in the areas named. The irrigated lands of these areas are far the most valuable in the USSR, not in the least because the warm climate permits growing crops, mainly cotton, for which the rest of the USSR is too cold.

There is apparently no opportunity for *economically justified* irrigation on a large scale outside of the three territories named. Local projects at best will provide water for vegetables and potatoes.

In 1932 the Party came out with a decision of irrigating 4.0-4.3 million hectares of land by damming the Volga not far from Kamyshin. Completion was set for 1938. Vastly exaggerated claims were made when the project was approved, even though the problem of the dam was not settled. It cannot be stated whether the project was intended merely to console the starving population with expectations of milk and honey sweetness in the future. The ignorance of those in power was really so great that they may have believed in the project. It turned out later that about fifteen years would be needed for completion if work on the project had been started at all. But not even a spadeful of earth was turned.

In 1938 the project was replaced by a much more modest one. The damming had to be done farther up the Volga. The irrigated land had to amount to 1 to 1.3 million hectares and the increase in output was expected to amount to 100 to 120 million puds ($1\frac{2}{3}$ to 2 million metric tons). If the land lost by flooding and the present yield of the land are considered, the net return would hardly be more than one-third of this. A start apparently was made on the project; the war stopped the work, however, and it was not resumed after the war's end and almost certainly will never be resumed again.

The government is concentrating its attention even more on small local irrigation projects. The new law of October 20, 1948, indeed calls only for some 45,000 new ponds in the vast territory, not bothering to state either the average or total size of the ponds. While ponds are certainly desirable, the whole thing is obviously of negligible significance.

Zone with Adequate Precipitation

This zone, in Central and Northern European Russia, comprises somewhat

less than one-quarter of the total land in crops other than natural hay. Grey forest soils, the poorest of the temperate zone, predominate. Much land is too acid for clover, almost indispensable in good rotation in this climate. The climate is severe; in the northeast it does not favor even the potato. Old and especially newly-cleared land frequently does not have even five inches of top soil. If the cleared land is not heavily manured—the standard practice in Russia—fertility falls off rapidly.

Ever since transportation facilities have permitted shipment of food from the distant steppe areas, agriculture of Central and Northern European Russia has been in a state of more- or less-severe depression. The farm population went heavily into handicraft and industry, providing industrial workers for even the Steppe areas. This situation could, however, continue only while there remained unused steppe land, the turning of which into cultivation would accommodate the additional population and provide food needed for the extra population. It will be shown that areas with inadequate precipitation once properly cultivated cannot be made to yield much more *even by a proportionately large application of capital and labor*. Once all land with inadequate moisture supply has been taken into cultivation, additional supplies of food for the Russian population have to come, to a large extent, from an increase of production in the areas with adequate precipitation. They cannot do it cheaply, but they can yield much more than they do today. There was a time when the German soils yielded 6 rather than the present 20 quintals of grain per hectare. Availability of commercial fertilizer has greatly shortened the time needed for such a changeover. Poorer climate makes it unlikely that Central and Northern European Russia can reach

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the German yields. But 15 quintals per hectare seems not impossible. Immense amounts of lime, manure, and commercial fertilizer would be needed, however.

The amount of land urgently needing lime in Central and Northern European Russia is estimated at 15 million hectares¹ and *all* land needing lime at 2 to 2½ times that much. At 5 tons per hectare, the urgently deficient area of Central and Northern Russia only would require 75 million tons. The amounts of needed manure and commercial fertilizer would be in proportion. Should such a large application of capital be decided upon, clearing of new land in the areas with sufficient precipitation (now a rather unpromising undertaking) would become advantageous on a very large scale. It seems by no means fantastic to assume that in some twenty to twenty-five years the present and new arable land of that territory may be made to yield about twice as much as those areas produce now; i.e., increase the present total output of farm products of the Soviet Union by close to 25 percent.

All that was stated above is by no means the writer's discovery but, except for the estimate of future gains, is common knowledge. The large amounts involved are, however, *fully the reverse of the whole Soviet policy of pumping the village for the greatest possible industrialization.* The first *Five-Year-Plan* (3rd ed. II, Part I, pp. 354-55) provided for the use of 11,068,000 metric tons of lime during the Plan period. The actual input then and later was negligible. For example, it amounted to 65,000 tons in 1932, 154,000 tons in 1933, and 185,000 tons in 1934.² Probably no more lime was used in the 20 years from 1928 to 1948 than was scheduled for 1932 in the first

Plan. The First Plan provided for the use of commercial fertilizer in 1932-33 on 1,382,000 hectares of potatoes. In the new order, "On the Measures of Raising the Crops of Food Products in Areas with Adequate Precipitation," September 16, 1947, the potato area receiving commercial fertilizer in 1948 was fixed at 145,000 hectares. All commercial fertilizer applied in the Central and Northern European Russia since 1928, including that applied to flax, compensated only for part of the manure lost through the reduction in the number of horses in conjunction with the collectivization drive.³

The order of September 16, 1947, is the precursor of the order of October 20, 1948, here discussed, but for the areas with adequate precipitation. Those in the United States who are so enthusiastic about the measures of the second order, and angry with those not sharing in the enthusiasm, have probably never heard of the order of September 16, 1947. This order was not given even one percent of advertisement bestowed on the second order. This is perfectly in line with the limited scope of the order. I was unsuccessful in getting hold of this order itself. My clippings do not contain the evidence of the quantities of lime and commercial fertilizer which have to be provided for food crops. Yet the amount of manure is mentioned and this probably indicates that the scheduled amounts of lime and commercial fertilizer are small. Certainly, the potato area which had to receive commercial fertilizer in 1948 according to the new law is negligible.⁴

¹ According to D. N. Pryanishviokov, *Nitrogen in the Life of Plants and in Agriculture of USSR*, Academy of Sciences of the USSR, Moscow & Leningrad, 1945, p. 172 and others, nitrogen and potash in commercial fertilizer compensated for only a fraction of losses in manure even in the whole of the USSR.

² The total supply of commercial fertilizer planned for the regions with adequate precipitation in European Russia in

(Footnote 4 continued on page 354)

³ Academician O. K. Kedrov-Zakhman, *Socialist Agriculture*, the daily of the Ministry of Agriculture, July 12, 1947.

⁴ *Socialist Reconstruction of Agriculture*, December 1935, p. 179.

When the government has more commercial fertilizer, much more probably will be provided for the food crops of Central and Northern European Russia than the almost negligible amounts provided for 1948; but there are no indications that the Soviet government intends to go into the task of raising the output of that area in a really big way.

Zone of Insufficient Precipitation

Experience of all countries in the temperate zone, including the USA, shows that natural conditions restrict the areas with inadequate precipitation to the growing of small grains by extensive methods. If the land is properly worked this can be changed. Poor seed can be replaced by good seed. But this is about all. Manure and commercial nitrogen, the potent means of increasing fertility in areas with adequate precipitation, prove ineffective where moisture is short and may even be harmful. The inclusion of grass in the rotation system for a year or two, which has revolutionized crop production in areas with adequate precipitation, also fails where moisture is insufficient. The competent O. R. Mathews and John S. Cole, summarizing the findings of prolonged experimental work in the United States, wrote on this as follows:

"Sod crops [grass] are considered a fundamental part of the rotation in many humid sections, but in dry-land farming they have not won a recognized place. The inclusion of sod crops in short rotation has not been a success. Establishing a stand of grasses is often too expensive unless it is to be left for more than two or three years."⁶

For a certain time attempts have been made to raise land productivity in those

areas by planting forest strips. Placed square to the prevailing winds, they reduce wind velocity in the protected areas (this is estimated at 20-25 times the height of the forest), help snow accumulations and reduce evaporation. In the Office of Soil Conservation, U. S. Department of Agriculture, I have been told that an increase in yields by 10 percent may be expected. Characteristically, in the official report on the shelterbelts at the Ardmore Experiment Station,⁶ the improvement of the appearance of the home is mentioned first among the advantages of shelterbelts. Another advantage mentioned there was the keeping of the snow away from the buildings. The checking of wind velocity was mentioned last, and nothing was said on increase of yields.

Moreover, the areas with insufficient moisture were naturally treeless. The less moisture and the more valuable the shelterbelts, the more difficult it is to establish the trees and keep them alive. A partial loss of seedlings is inevitable, and the plantings have to be given care for several years. Under improper conditions they simply die or become a breeding place for weeds.⁷

The fact that the law of October 24, 1948, intended to raise productivity in the zone with insufficient precipitation, is getting an enormous build-up while a similar law pertaining to the zone with adequate precipitation was passed almost secretly, at once makes suspicious those who want to analyze developments critically rather than to blindly accept everything that comes from the land of true democracy. This fact clearly shows that the Party does not want to apply its energy at the very spot where great results are possible, that the policy of in-

(Footnote 4 continued from page 353)

1948 was 700,000 metric tons or some 120,000 tons of plant food (*Socialist Agriculture*, Dec. 27, 1947), but most of it was intended for flax, hemp, kok-sagyz (the Soviet rubber plant), and other non-food crops.

⁶ "Special Dry-Farming Problems," *Yearbook of Agriculture*, 1939, U. S. Department of Agriculture, p. 692.

⁷ U. S. Department of Agriculture, *Circular 421*, pp. 43-47.

⁸ *Ibid.*, p. 38.

dustrializing primarily at the expense of the village remains untouched. The build-up given to the intended measures in the zone of inadequate precipitation has the purpose of distracting attention from the real trouble.

In addition to the approximately 45,000 ponds, the law of October 24, 1948, provides for forest plantings and rotations. All that has to ensure not more and not less "high and stable yields in any conditions." It is fortunate that all the trees are not supposed to be planted until 17 or 18 years have passed and that many more years will have passed before all of them have grown. By then the utter disparity between goals and means will be irrelevant.

The law providing for activity 17 years hence and later was passed without any preliminary discussions—at least discussions reflected in the press. The very outburst of supporting evidence has come later. The law itself indeed came like *deus ex machina*. To conceal its true character a page-long enumeration of such technicalities as the kinds of trees to be planted in every small area, or the number of machines in each special machine-tractor station, had been included in the law itself. But the search for even a vague indication of the involved costs is in vain. As to the relevant problem of compensation of the present holders of the land which would be used for the state forest strips, the law was satisfied to entrust two ministries while working out the basis for this transfer until January 1, 1950.

Forest Plantings

Planting of forest strips on a large scale was started in the Soviet Union in 1931. Because of inefficiency and other reasons the loss of seedlings was heavy.

* P. Vystavkin, "The State of Field-Protecting Forest Plantings," *Socialist Reconstruction of Agriculture*, December 1938, pp. 98-99.

Half of the trees planted in the southeast before the war was lost. In the far southeast, Chkalov, Astrakhan, the loss amounted to three-quarters of the original plantings.⁸ The strips suffered further heavy losses in the war in Kuibyshev, Chkalov and Astrakhan.⁹ Only about 5 percent of the original plantings remain. These results and even the better results in the United States hardly justify the decision to plant 14 million odd acres of forests during 18 years, prescribed by the new law. There seems to be little evidence that the plantings will be done much more efficiently than in the thirties. Plantings are scheduled to be made not only in the spring when they apparently have the greatest chance to survive, but to a large extent also in the fall. For 1949 even direct plantings of seed are planned,¹⁰ a procedure not even contemplated elsewhere for such conditions.

Of the total of some 14 million acres of forest strips, some 300,000 acres have to be state strips, extending hundreds of miles, mostly along the great rivers, Volga, Ural, Don, and Donets. These strips, very limited in total area, can have only a moderate effect, for example, in causing a somewhat more even flow of the rivers. Yet they have been given the greatest build-up as a kind of savior of an immense zone extending hundreds of miles west from the strips, from the scorching eastern winds and droughts—as a means to ensure high and stable yields, indeed to rebuild nature.

A map accompanies the text of this law, which has been probably distributed in tens of millions of copies. The state strips are drawn on it at a scale about 20 times the real scale—clearly with the intention to create the idea of broad impenetrable walls. In the Soviet press

⁸ Leader in *Socialist Agriculture*, June 11, 1947.

¹⁰ A. P. Bochkazev (the boss of Kuibyshev oblast), *Socialist Agriculture*, November 14, 1948.

they are indeed so interpreted. Unfortunately, those walls are supposed to be only about 20 yards high, rather than to touch the sky and, according to both American and Soviet experience, their effect will not extend beyond 500 yards to the west. As an example of the build-up given the shelterbelts, with the state belts placed at top, the very influential *Literaturnaya Gazeta*, the organ of the Union of Writers, October 27, 1948, may be cited:

"The landscape is changing. Where there were naked steppes, will be forests. The devastating sukhovei [dry scorching winds] will shatter against them. Dustbowls which blow away the fertile topsoil will disappear forever. The climate will change, the very geography of the vast territory equalling almost the whole of Europe, will change. And all this during the time of one generation. What generation! Today's pioneers will still be Komsomoltsy [Communist youth] when the drought—that whip threatening us—will have become a thing of the past, of which one could get information only from novels and textbooks. This is not a phantasy of a writer, but an exact, spaced, yearly, plan . . ."

This eulogy extends over three full columns under the title, "Such are the Ways of History." The trees will give full protection before some of them will have been planted.

Part of the prescribed tree plantings are certainly very desirable. This is particularly true of plantings on sandy soil, in ravines and on steep slopes, most of which are not usable as arable land anyway. But the project as a whole will probably involve a cost far beyond its worth. The peasants who have to be the principal bearers of the cost will again be the goats. The strips will prove the less successful the farther one moves east, i.e., the more beneficial they would be if established.

Rotations

The recent gala Lysenko discussion with its worshipping of the heroes and crucifying of the goats has a direct connection to the rotations prescribed by the discussed law. Those rotations, which are an essential part of the measure to ensure high and stable yields in the steppe and forest-steppe areas, have been fathered by Williams, the great Soviet authority, whose infallibility was proclaimed by decisions of the Party. The peculiarity of these rotations is in the one to two years of grass every seven to ten years.

The results at the Kamennaya-Steppe Experiment Station in Voronezh Oblast are now endlessly cited as the principal proof of the great effects of the shelterbelts and Williams' rotations—Williams personally recommended to the Station a seven-year rotation with only one year of grass. Later 8-9-10 year rotations were added with two years of grass.

These rotations obviously are the same as those which failed in the United States. Yet, really fabulous results are claimed for them both in combination with the strips or without. The preamble to the law of October 20, 1948, reports for the Kamennaya Steppe Station yields of 20-25 quintals per hectare of grain, or 30-37 bushels to the acre, i.e., yields unobtainable even with artificial irrigation to the areas. The previously cited Boiko reports the following yields of grain in the 7-year rotation in Kamennaya Steppe without shelterbelts (quintals per hectare:)

Average of 1937-39.....	13.3
Average of 1940-42.....	16.8
Average of 1943-45.....	20.4

The preamble of the discussed law has a few more spectacular achievements to report similar to those at Kamennaya Steppe.

It is obviously impossible to believe that the same rotations, which failed in the United States, are an immense success in the ecologically almost equal areas of the USSR. It is specifically of interest that it is claimed for the Williams' rotations that the crop grown directly after grass (spring wheat is urged for this place in rotation) is doing marvelously. Mathews and Cole wrote on this: "While the long-time effect of a grass crop (in rotation) may be good, its effect on the crop immediately following is generally bad, because it leaves the soil exceedingly dry."¹² It seems also absolutely improbable that experimental work in this particular case turned out in the USSR to be ahead of that in the United States. On the contrary, the Lysenko discussion and similar, less spectacular occurrences make it possible that some of the experimental results included in the preamble of the law and greatly advertised otherwise may simply have been doctored. Those results in any case are picked results.

Motovilov, the Minister of Forestry, writing in connection with the law of October 20, 1948,¹³ reported the results at the Timashev Experiment Point (Kuibyshev oblast) of the All-Union Research Institute on Agro-Forestry Melioration. The experiments extended over exactly the same 12 years as the Kamen-naya Steppe. (Type of rotations not stated.) He claimed increases only of 2.5 quintals per hectare of winter wheat and 2.0 quintals per hectare of spring wheat, or of about 15 percent of the shelterbelt protected area. Unfortunately, I do not have the results of the experiments of the Scientific Research Grain Institute for the Southeast, i.e., the very area primarily involved in the here-analyzed law. The summaries to these

results emphasized the same negative effect of grass on the succeeding crop which were revealed by experiments in this country. These summaries cost Y. I. Ryasanov, director of the Institute, and Professor Doyarenko, immediately in charge of the work, their jobs.¹⁴ Many more results probably were obtained but were never released.

There is no doubt, furthermore, that even when an increase in yields actually occurred, it was mostly or always due not to specific rotation or to forest strips, but was brought about by better management of the farms. There is an immense number of mismanaged farms in the Soviet Union, some of which occasionally improve considerably.

Those persons have to be given up as hopeless who have not been persuaded even by the latest Lysenko discussion that scientific and experimental work is to such an extent handicapped in the Soviet Union as to make real progress extremely unlikely. This attack on the remnants of science was too much even for Nemchinov, the director of the Timiryazev Academy and long-time party member. (A table prepared by Nemchinov was made famous by having been quoted by Stalin way back in 1929.) Nemchinov preferred to lose his job and to expose himself to even greater risks, rather than participate in the cleaning of his academy of all those who (*horribile dictu!*) insisted on having opinions on botany of their own.

Any increase in yields due to Williams' rotations needs better proof than those advertised in the preamble of the law of October 20, 1948. The forcing of the Williams' rotations upon every farm is certainly a misuse of the dictatorial powers of the state. (It has to be remembered that the shelterbelts are to be so planted that later changes in the

¹² *Op. cit.*, p. 692.

¹³ *Socialist Agriculture*, October 31, 1948.

¹⁴ *Socialist Agriculture*, December 5, 1948.

number of years in the rotations will be impossible.) The insufficiency of roughage was greatly intensified by the plowing up of great stretches of meadows and pastures in the thirties. Grass has to be grown on arable land, but it may be doubted whether it has to be grown on every field.

Observations in Conclusion

The above analysis is made without consideration of the latest unfavorable developments in the climate of the USSR, namely, the rising temperatures and reduced precipitation—both of them reflected in a substantial lowering of the water level of the Caspian Sea. The duration of those phenomena has been too short for them to be accepted as long-time trends. The trend, indeed, can change in the opposite direction any time. But, should it persist, the need of a

fundamental reorganization of the agriculture of Central and Northern European Russia will become even more pressing and in its development the Soviet Union could well make use of those scholars who do not see eye to eye with Mr. Lysenko.

All evidence released on the 1948 crops is limited to a dozen words on the grain harvest in all of the USSR. The 1949 plan for agriculture was withheld entirely. Yet the papers of December 30, 1948, brought a 21-column report (including two big maps) on the progress in fulfillment of the order of October 20, 1948. This is an additional proof of the build-up for a project without immediate effects—a build-up which has to distract attention from other more immediate things. The law of October 20, 1948, cannot be correctly appraised unless treated as a single item in a big frame.

USSR: The Fifteen-Year Afforestation Plan

By JOSEPH J. BULIK

POPULARLY, this fifteen-year program is called the "afforestation" plan but the actual title of the decree of the Council of Ministers and the Central Committee of the Communist Party includes plans for shelterbelts, for introducing crop rotations, for the construction of ponds and reservoirs in order to insure high and stable yields in the steppe and forest-steppe region of the USSR.

One of the weakest points in the Soviet agricultural economy is the lack of uniformity in grain production from one year to another. To a population that is so dependent upon grain as the Soviet, the consequences of extreme annual variations in crop production varied as much as 31 million metric tons, from 89.4 million metric tons in 1934 to 120.3 million metric tons in 1937, according to official Soviet statistics. See Table I.

The question of the ability of agricultural production to keep pace with an increasing population undoubtedly is of serious concern to the Kremlin. The USSR does not have the reputation of providing an abundance of food for its people.

The question may be raised, "Why does not the USSR have a stockpile of grain large enough to take care of production deficiencies in poor crop years?" With a possible spread of 30 million tons or more of grain from one year to another, the difficulties attendant upon the procurement and storing of a necessarily huge stockpile and of rebuilding it, once it has been used, are obvious.

Another "apparent" solution would be to increase the acreage under cultivation, but soils, climate, manpower, draft power, and difficulties of irrigation and

reclamation are limiting factors to such an increase in acreage. Besides this, an acreage increase will not prevent the spread in production from one year to another. As a matter of fact, the 1950 grain acreage is planned to be slightly (4.3 percent) below that of 1940. The emphasis is definitely on increased yields.

TABLE I—USSR: GRAIN ACREAGE, YIELD AND PRODUCTION IN SPECIFIED YEARS (a)

Year	Acreage in Hectares (b)	Yield in Centners per Hectare (c)	Production in Metric Tons
1913.....	94,400,000	8.5	80,100,000
1922.....	66,200,000	7.6	50,310,000
1923.....	78,600,000	7.2	56,590,000
1924.....	82,890,000	6.2	51,410,000
1925.....	87,300,000	8.3	72,460,000
1926.....	93,700,000	8.2	76,830,000
1927.....	94,700,000	7.6	72,300,000
1928.....	92,200,000	7.9	73,320,000
1929.....	96,000,000	7.5	71,740,000
1930.....	101,800,000	8.5	83,540,000
1931.....	104,400,000	6.7	69,480,000
1932.....	99,700,000	7.0	69,870,000
1933.....	101,500,000	8.8	89,800,000
1934.....	104,700,000	8.5	89,400,000
1935.....	103,400,000	8.7	90,100,000
1936.....	102,400,000	8.1	82,730,000
1937.....	104,400,000	11.5	120,290,000
1938.....	102,400,000	9.3	94,990,000
1939.....	99,653,200	10.7	106,470,000
1940.....	110,400,000	10.7	118,800,000
Goal 1950	105,700,000	12.0	127,000,000
Average 1928-32...	98,820,000	7.5	73,668,000
Average 1933-37...	103,800,000	9.1	94,464,000
Average 1936-40...	103,860,000	10.1	104,656,000

(a) From official Soviet sources

(b) One hectare equals 2.471 acres

(c) One centner equals 220.46 pounds or one-tenth of a metric ton

Total grain production in 1950 in the USSR is planned at 127 million metric tons. Assuming a population of 198,900,000 in 1950, a per capita grain production of 639 kilograms is obtained. Assuming that the population in 1970 will be 255,000,000 and that the per capita production of grain of 639 kilograms will be desired, then a total grain production of 162.9 million tons of grain will be required. This is nearly 36 million tons

more than planned production for 1950. If it is assumed that the 1970 grain acreage will be 115 million hectares (as compared with planned grain acreage of 105.7 million hectares in 1950) then the average yield of grain in 1970 should be 14.2 centners per hectare. This yield is 41 percent over the average 1936-40 yields and 56 percent over the average yields for 1933-37.

The problem thus becomes real. The USSR must increase considerably its grain yield per hectare if the grain supply is to keep pace with growing population.

It is interesting to speculate as to the effect which the afforestation program may possibly have on grain production in 1970. See Table II. The Kamennaya

TABLE II—USSR: ESTIMATED EFFECT OF AFFORESTATION PROGRAM ON THE GRAIN YIELD IN 1970

	Acreage in Hectares	Yield in Centners per Hectare	Production in Metric Tons
A. Without Afforestation Program:			
In the afforested areas.....	55,000,000	12.2	67,000,000
In the rest of the USSR.....	60,000,000	11.8	71,000,000
Total USSR ..	115,000,000	12.0 average	138,000,000
B. With the Afforestation Program:			
In the afforested areas.....	55,000,000	13.4	73,800,000
In the rest of the USSR.....	60,000,000	11.8	71,000,000
Total USSR ..	115,000,000	12.6 average	144,800,000
C. To Reach the 1970 Goal:			
In the afforested areas.....	55,000,000	16.7	91,900,000
In the rest of the USSR.....	60,000,000	11.8	71,000,000
Total USSR ..	115,000,000	14.2 average	162,900,000

Steppe Station reported an average increase in yields for 5 grains and pulses of 15.3 percent in fields enclosed by trees as compared with fields on the open steppe. Six varieties of winter and spring wheat showed an average increase of 19.7 percent

with a range of 14 percent for a certain variety of spring wheat to 30 percent for a certain variety of winter wheat. The average increase for the winter wheats was 72 percent while that of spring wheats 17 percent. Obviously, these tests were made under optimum experimental station conditions. It is doubtful that a 15 percent increase would be obtained on the 80,000 collective farms to be affected by the program.

If it is assumed that a 10 percent increase in average grain yield is obtained in the afforested areas, then the grain productions of the USSR theoretically would be increased as follows: (a) assuming that in 1970 the grain acreage will have been increased by roughly 5 million hectares to a total of 115 million hectares; (b) assuming that the per capita production of grain will be planned at the same level as in 1950, i.e., at 639 kilograms per capita annually; (c) assuming that without the afforestation program the average grain yield in the USSR in 1970 will be 12 centners per hectare, then a 10 percent increase in grain yield in the afforested areas will result in total grain production of 144.8 million metric tons. Thus, a 10 percent increase in grain yield in the afforested areas will not prove sufficient to increase the total grain production to

the desired 162.9 million metric tons. In order to achieve this goal the afforested areas must have an average grain yield of 16.7 centners per hectare which is 37 percent over the theoretical normal average of 12.2 centners per hectare.

It is clear that the afforestation program by itself will not cure the Soviet Union's perennial grain problem. The program is only one of many measures that could be undertaken by the Soviets to raise the per capita level of grain production. Some agronomic measures include the use of high-quality seed, improved methods of cultivation, proper handling of farm machinery at all phases of field work, and extension of crop rotation to all farms.

Some efforts are being made to raise the northern limits of agricultural production but any significant contribution to the Soviet Union's agricultural economy may be generations in coming. It is clear, therefore, that some relief may be obtained in two decades if the afforestation program is successfully carried out in the areas more or less subject to periodic droughts. The average level of grain production may be increased and the spread in grain production between dry years and good crop years may be lessened.

USSR: The Shelterbelt Program in its Relation to Other Drought Control Projects

By SOLOMON M. SCHWARZ

THE scope of the program of fighting the danger of the drought in the Soviet Union, as it was announced in the decree of October 20, 1948, clearly was underestimated in this country. Newspapers have widely publicized an Associated Press report on an interview with a high officer of the Department of Agri-

culture who spoke of the modesty of the Soviet program compared with the activities of Soil Conservation Service in this country. This appraisal of the Soviet program is basically false. One example may suffice. The creation of shelterbelts is the most prominent part of the Soviet program. According to the

Associated Press report, the Soviet program envisages the planting of 3,000 miles of shelterbelts in the period from 1949 to 1965, i.e., in 17 years, against 18,000 miles of shelterbelts planted in the United States during a decade. It is true that the Soviet program envisages the planting of eight large shelterbelts of that aggregate length, but their aggregate area is 291,000 acres compared with 286,461 acres of shelterbelts planted in this country under the Soil Conservation Service until July 1, 1947. But these eight large so-called state shelterbelts are only a small—though the most publicized—part of the Soviet program of shelterbelt planting. Besides these the kolkhozy and sovkhozy have to plan in the period from 1949 to 1965 over 14,000,000 acres of shelterbelts, fifty times the area of the large state shelterbelts. This is not a modest but rather a much too gigantic program.

The primary purpose of the program is to fight the influence of the dry and hot winds blowing from the trans-Caspian semi-deserts which bring drought and famine mainly to the areas of the Middle and Lower Volga. In the last decades the North Caucasus, the Ukraine, and even some near-central provinces of Russia have been in the path of this menace. In 1892, after the famine of 1891, the great Russian soil scientist, (today we would perhaps call him "soil conservationist") Dokuchayev, stated that the climatic conditions in the south and south-east of Russia had markedly deteriorated compared with conditions a few decades before. Since then the situation has become more dangerous.

After the drought and the famine of 1931 various programs to eliminate the danger were discussed, mainly in the framework of the so-called Great Volga Project, a kind of Russian TVA, but much larger than its American prede-

cessor. In the framework of the project the drought was to be fought not by the means of shelterbelt-planting but primarily by irrigation. The Russian scientists working on the Project published much data about the water problem in the whole area, which are today of importance for the appraisal of the new shelterbelt-planting program.

The crucial problem of the Great Volga Project was that of the water-balance of the Caspian Sea. As it was calculated by the Power Institute of the Academy of Sciences in 1938, the Caspian Sea loses yearly through evaporation from its surface 437 cubic kilometers of water, and this is the main source of the precipitation in the trans-Caspian semi-desert. The Caspian Sea recovers those losses as follows: influx from rivers 348 cb. km., influx from subterranean waters 4 cb. km., precipitation on the surface of the Caspian Sea 85 cb. km. Of the 348 cb. km. from the rivers, 268 cb. km. come from the Volga, i.e., 61 percent of the whole yearly water income of the Caspian Sea.

The realization of the Great Volga Project would diminish the influx of the Volga water into the Caspian Sea; thus, it would cause the fall of its level; thus it would diminish its surface; it would diminish the aggregate amount of the evaporation from the surface of the sea; it would diminish the precipitation in the trans-Caspian semi-deserts; it would increase the danger of the dry and hot winds and the danger of the drought in the Volga and other areas. To break this *circulus vitiosus*, water from other basins was to be diverted to the Volga. This was planned to a smaller degree from the Don River through the construction of the Don-Volga canal, to a much greater degree from the northern rivers through building of a large reservoir (a new lake) on the watersheds between

the Volga and the northern rivers—Northern Dvina and Pechora.

The preparatory work was interrupted by the war. After the war the Great Volga Project, already approved in its final form by the government, was widely changed and especially the great irrigation plan envisaged by the project was quietly dropped. The probable cause of this fundamental change in the project became clear in 1947 when it was published that the level of the Caspian Sea has been falling almost continuously, since 1932, and from 1932 to 1945 dropped by 177 cms. The level of the Caspian Sea never was completely stable and showed some ups and downs from year to year, corresponding mainly to the wavering of the amount of precipitation in the Volga basin. Of course, the development showed in the last hundred years a moderate downward trend: a fall of the level of the Caspian Sea from the middle of the last century to the beginning of the 1930's by approximately 50 cms. What was new in the recent development since 1932 was a sharp trend downward: the level of the Sea began to fall at an unknown tempo and its surface shrank from 436,340 sq. km. in the early '30's (including the large Gulf Kara-Bugaz) to 377,000 sq. km. (excluding Kara-Bugaz, which became a lake separated from the Sea by a strip of land and, if not connected with the Sea by a canal, doomed to dry out in a few years).

The main cause of this development is the change of the climate in the basin of the Upper Volga, the rise there of the yearly temperature which, by the way, is a phenomenon observed also in this country.¹ The plan to divert water from the basins of the northern rivers to the Volga has won now a new importance. Its main purpose, however, will be to

recuperate the deficit in the water supply of the Caspian Sea. Hardly anything will remain for irrigation on a large scale.

This seems to explain why the fighting of the drought in the Volga area is now based not on irrigation but on shelterbelt-planting. But the planting of shelterbelts is handicapped in an important part of the endangered area by the lack of precipitation and the unfavorable conditions leading to the drought. In the United States forest planting is considered promising only if the average yearly precipitation is no less than 15 inches and only a few kinds of Californian trees are grown in regions with ten inches' precipitation. A precipitation map of the Soviet Union would show, however, that only near Kuibyshev does the precipitation reach 40 cms., that from Stalingrad to the south it is below 30 cm. and in the mouth of the Volga even below 20 cm. The basin of the Ural River is in a much worse situation. But this is just the area where most of the large state shelterbelts had to be planted. This beginning can be only partly successful, and even then very costly.

More favorable are the conditions of precipitation to the north and to the west of those areas. Here the plan prescribes a gigantic program of shelterbelt planting mostly by the kolkhoz peasants on the expense of their remuneration for the so-called "work days." But the payment for the "work days" has been very low in recent years, much lower than even the moderate payment before the war. A great number of "work days" will now be utilized in the planting of shelterbelts, whose advantages will be felt only after years (and even then not everywhere). The unavoidable result is the hard pressure of the payment for the "work days" in the coming years. Here we touch on social implications of the new program.

¹ See report of Kincer in *Monthly Weather Review*, U. S. Weather Bureau, September 1933.

COMMENTS IN SUMMARY

Derwent Whittlesey: In reference to both agriculture and shelterbelts, I have pointed out in my writings that there is a fundamental difference between semi-arid regions and humid regions. In humid regions precipitation is fairly reliable and, in all droughts except the most extreme, adequate for the growth of both crops and trees. In semi-arid regions, rainfall is unreliable, with barely enough in average years. Even if the plants are selected for ability to get along with very little moisture, they suffer when long spells of drought occur, as they do every few years.

Total amount of rainfall and reliability go together; that is, the less rain on the average, the less certain is the year's total to approximate the average. Some years may have much more or much less rain than the average, and there is a cycle of more rain and less rain periods. In semi-arid climates this cycle is sure to bring about serious droughts lasting from two to five years, or six, once or twice in a generation. During drought years crops are partial or total losses and plants in shelterbelts die.

I challenge the statement, made, I believe, by Mr. Schwarz, that implied an abundant source of moisture for Central Asia in the Caspian Sea. Nearly all the rain that falls on the lands is derived from the oceans and not from inland bodies of water. I know of no proof of this rule for the Caspian area, but it seems a reasonable analogy to the Great Lakes of North America where studies have shown only negligible moisture ascribable to the lakes. Therefore, Central Asia cannot hope to receive any considerable precipitation derived from evaporation off the Caspian Sea. Countering this statement of mine someone pointed out that the Elburz Mountains do receive showers that seem to derive their moisture from the Caspian Sea. I agree that this is entirely possible for the narrow strip of mountain slopes along the south margin of the Caspian Sea.

M. Y. Nuttonson: In reference to a statement of Dr. N. Jasny in which I believe he suggests that, on the basis of past statistical data of grain production in the USSR, he does not think that any significant increase in the crop production potential of the USSR is possible: I believe he mentioned that he may be willing to consent that the maximum 2% increase in yield may be possible. My comment to this is that even the most pessimistic of the modern Malthusians should not formulate the future of man in relation to potential food resources on the basis of past statistical data alone. Suppose we had studied the past records of corn production among the American Indians and among the American farmers prior to the development of the improved corn varieties and especially prior to the development of corn hybrids. Would the statistical analysis of those past yield records of corn suggest in any way the revolutionary increase in yield due to hybrid vigor phenomenon? The use of heterosis in the production of agricultural crops is almost at its very beginning but its achievements in the field of plant breeding and applied genetics are already far-reaching from the viewpoint of potential crop production.

In many parts of the corn belt of the United States it was not so long ago that many farmers used to think that 40 bushels of corn to the acre was a pretty decent crop, but with the corn hybrid of today many a farmer would be a very much worried man were he to get less than twice that yield! In the Po Valley of Northern Italy some of the newly-introduced American corn hybrids have produced yields of more than 100 bushels per acre as compared with the 48 bushels produced by the best locally-grown standard corn variety. That means an increase of more than 200% in yield. However, corn is just one of the many examples that one could cite which point to the need to consider scientific progress in the natural sciences when appraising the race between population and food. One must remember that scientific and technological progress of one country is universal in its implications and it is just a matter of time before all countries share in such progress. In other words, I would be reluctant to accept Dr. Jasny's verdict as to the possibilities of the increase in grain and food production of the USSR.

In reference to a statement of Professor G. B. Cressey that much of the eight million square miles of the USSR is too cold, or too dry, or too wet, or too infertile, or too mountainous to be very attractive as a place to farm and as a home for men: He drew lines on a map

from Leningrad and the Black Sea roughly eastward to the Lake Baikal in Central Siberia and suggested that within this triangular wedge will be found almost the only land fit to live in and to farm. I presume that from the viewpoint of one who has the agricultural environment of Iowa in mind that statement is correct. It may also be correct from the viewpoint of a rational world-wide geographical planning of agricultural production. However, since we have not yet reached the latter stage and self-sufficiency is still the goal for many countries and, since there are very few Iowas in this world, this statement does not tell the whole story. The wish to survive is a tremendous incentive to learn how to get along even under unfavorable environmental conditions. Science and technology coupled with a determination to live and to improve one's lot have limitless potentialities in the conquest of obstacles and in the changing, subduing and modifying of the physical environment. Wet land can be drained; dry land can be irrigated; it can also respond to a combination of sound dry-farming practices and suitable crops. Mountain regions with their meadows and forests lend themselves to a number of agricultural enterprises. Cold regions of the North have a relatively short growing period but fortunately they are also subject to a long day which speeds up plant growth and hastens the completion of its life cycle. Thus, one finds, for example, that Marquis wheat which requires more than 150 days to complete its life cycle in Tlalnepantla, Mexico (latitude 19° N.), matures in less than 90 days from the date of sowing at Fairbanks, Alaska (latitude 64° N.). Russian scientists in Northern Siberia have found that a great number of various kinds of plants will grow and ripen under the long polar day with a very great speed. Plant selection and plant breeding permit the development of early maturing and hardy plant varieties. Vernilization of seed also often shortens the growth period. The Scandinavian countries may serve as a good example of what man has done and accomplished in these agricultural endeavors under rather difficult environmental conditions of the North.

Taking all the above factors into consideration, I am afraid that I cannot agree with Dr. Cressey's viewpoint in appraising the agricultural potentialities of the USSR.

S. M. Schwarz: It was stressed here that the shelterbelts can improve the micro-climate and that they can also increase the yearly amount of the precipitation and thus change the macro-climate, i.e., the climate. For the micro-climate it is true, without doubt. But how the shelterbelts can increase the yearly precipitation remains a riddle. Of course, some changes of the micro-climate can be achieved by some complicated means. In the Soviet Union a project was presented and published in 1938 which would seek to change the climate in the northern part of the Transcasian semi-desert and to influence in this way the climate in the southeastern part of European Russia by diverting an important part of Ob River waters to the south and by creating here large "evaporating surfaces." The project in its present form is fantastic. But in principle such ideas cannot be simply discarded. This has, however, nothing to do with the Soviet plan of October 1948.

Pessimism was expressed here about the possible agricultural development of the Soviet Union and even more about her possible demographic development. This pessimism is partly justified when we speak of the Soviet Union as it is today. But it is not justified by the geographic and demographic conditions of the country. The handicaps are not in the geography, but in the political and economic system. Under favorable conditions the country could rise economically in a relatively short time to a high level, including a very important rise in agriculture, and it could guarantee to a growing population an honest standard of living, somewhat paralleling in development the development of this country in the last third of the 19th century.

The Evolution of the Cuban Land System

By LOWRY NELSON*

DURING the four and a half centuries of occupation of Cuba by Europeans, the systems of land use, land distribution and land division have passed through several phases. These various phases are not always sharply differentiated in time. Often they overlap and merge into or even run parallel to each other. The dates indicated for each period are only approximate and do not in most cases represent an absolute point of beginning and ending of each land system; they do, however, include the years when each system was at its height. The following rough designation as to time periods and general characterization as to the nature of the different phases is approximately true to historical fact:

1. The *encomiendas*, 1513-1550.
2. The *mercedes* and the *haciendas comuneras*, 1536-1729.
3. Break-up of *haciendas comuneras*, 1700-1820.
4. The expansion of sugar production through multiplication of the number of small mills, 1790-1870.
5. Rise of the sugar latifundium: increased use of railroad and other technological improvements, 1870-1895.
6. The sugar latifundium in full flower, 1900-1933.

*The Encomienda.*¹ This was a right to the labor of a specified number of Indians granted by the Crown to a colonist. The Spaniard was made responsible for

the spiritual and temporal welfare of the natives "commended" to him. In other words, the Indians were to be fed and clothed and their health looked after and, above all, converted to Christianity. Although the institution had its origin in Hispaniola under Columbus, it had its antecedents in the period of the reconquest of Spain from the Moors when the Catholic Monarchs distributed lands among the Spanish chieftains.²

A brief exposition of the origin of the *encomienda* may be in order, not only because it played a role in the early history of Cuban land tenure, but also because it became so important in other parts of Spanish America. Its roots are traceable to several sources. In the first place, it is clear from the writings of Columbus that (a) the primary object of his voyages was the acquisition of gold, thought to be of fabulous quantities in Cathay, which he expected to discover (and thought he had discovered); and (b) whatever labor or toil was necessary in the new country was certainly not to be performed by Spaniards. There is apparent in his records the assumption that the people they were to meet at the journey's end would become subordinate to the will of the Spaniards. Forced labor on the part of the natives—if not actual slavery—was a foregone conclusion.

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¹ Dating the period of the *encomienda* in Cuba from 1513 to 1550, the author is aware that the institution survived in the Spanish colonies for two centuries following, but in Cuba it was without important force and effect after the natives were exterminated—as they were largely by approximately 1550. For an excellent discussion of the *encomienda* and other aspects of land tenure in the Spanish colonies, see David Weeks, "The Agrarian System of the Spanish American Colonies," *Journal of Land & Public Utility Economics*, February 1947, pp. 153-168.

² See Robert S. Chamberlain, "Castilian Backgrounds of the Repartimiento-Encomienda," in *Contributions to American Anthropology and History*. Publication No. 509, vol. V, article 25, Carnegie Institution of Washington. In the Indies, however, the division of land (*repartimiento de tierras*) was of less significance than the "division" of the Indians. The Spanish "colonists" were by no means agriculturally inclined; they wanted gold and nothing else, except enough food to live on while securing the gold. Weeks, (*op. cit.*, p. 157) while taking a different point of view from Chamberlain, agrees with the thesis that the *encomienda* in America had its precursors in Spain, and even in ancient Rome.

Secondly, when Pope Alexander VI divided the newly discovered territories between Spain and Portugal (papal bulls of May 3 and 4, 1493), it was agreed that the first duty of the monarchs of the two countries was to convert the natives to Christianity. Hence the specification in the *encomienda* regarding the responsibility of the Spaniard for the spiritual welfare of the natives given him in trust. As Lesley Byrd Simpson says:

"They [the monarchs] were, in fact, spiritual viceroys of the Holy See. With this assumption by the civil government of the religious mission it soon found itself between the devil of papal displeasure and the deep sea of economic necessity. On the one hand the government undertook to see that the natives were protected and made Christians; on the other, it was bound to favor the multitude of Spaniards who had gone to the Indies in the hope of some material reward, while the needs of the poverty-stricken Crown could not be lost sight of . . ."³

The "needs of the poverty-stricken Crown" it was hoped would be met by the acquisition of the fancied gold supplies they expected to find at hand. While the islands of the Caribbean were not devoid of gold, they did not contain the precious metal in abundance. That which existed in the hands of the Tainos when Columbus arrived—a not impressive amount—represented the accumulation of generations, as S. E. Morison suggests.⁴ Gold was obtained in three ways, successively. At first, the Spaniards traded the Indians trinkets for their gold ornaments. These trinkets consisted mainly of hawk's bells, bright colored caps, and other cheap merchandise, of which apparently the sailors brought abundant supplies. The hawk's bells were especially popular with the natives.

³ Lesley Byrd Simpson, *The Encomienda in New Spain* (Berkeley: University of California Press, 1929), p. 19.

⁴ S. E. Morison, *Admiral of the Ocean Sea* (Boston: Little, Brown and Company, 1942), p. 492.

In short order the ornaments on hand were obtained by this beguiling process.

After the visible supply of gold was exhausted, the only recourse was to begin mining new supplies, washing it out of the beds of rivers and smaller streams, clearing land and trenching it until by such prospecting a new productive area might be found. This involved hard labor, to which neither the Indians nor the Spaniards were accustomed. But the latter had no other thought than that the Indians should be the ones to do the hard work. In passing, it might be in order to record the opinion of one historian—certainly shared by many others—that the Spaniards who came with Columbus and others in those early years were not a particularly praiseworthy lot. Simpson calls them "riff-raff," consisting of ex-soldiers, broken noblemen, adventurers, criminals and convicts.⁵ Moreover, manual labor was looked upon as degrading in the Spain of that period.⁶ Thus, they had neither the conscience to prevent them from enslaving others, nor the cultural conditioning to fit them for performing manual tasks without losing prestige. The second stage in the quest for gold was to levy tribute upon the Indian chiefs. This was instituted in Hispaniola in 1496.

The impossibility of this scheme of securing gold soon became apparent. The natives, unaccustomed to the arduous toil and being poorly fed in the meanwhile, suffered incredible mortality. During the next trip of Columbus to Spain, matters again got out of hand in the island. The Indians were restive under the cruel imposition of the tribute system. Disaffection among the Spaniards, led by Francisco Roldán, threatened the authority of Bartholomew,

⁵ *Op. cit.*, p. 25.

⁶ For a discussion of the role of this fact in the class structure in Cuba, see the author's forthcoming volume, *Rural Life in Cuba* (University of Minnesota Press), chapter 8.

brother of Columbus, who was acting governor. Roldán promised the chiefs that no more tribute would be levied, and the Spaniards were promised a life of ease, with plenty of Indians to dig gold for them, free passage home and no taxes.⁷ How he might fulfill both promises, it was not useful for him to attempt to explain at the time. Subsequently, however, the third system of exploitation to become known as the *encomienda* solved the apparent paradox. Roldán negotiated an agreement with Columbus which among other things granted to Roldán and his followers free land grants in Xaragua (a province on the south part of the island) for those who chose to remain. "Moreover," says Morison, "he established . . . a system of exploitation that became the basis of social institutions of New Spain. This was the system of *repartimientos*, later known as *encomiendas*."⁸

This system was approved by the chiefs because it relieved them from the intolerable tribute system—fulfilling thus Roldán's promise to them—while at the same time it gave the Spaniards what Roldán had promised them; that is, Indians to do the work for them. Although some writers consider the *encomienda* to have originated in the administration of Ovando from 1502-1509, the essential features of the institution seem to be embodied in this arrangement between Columbus and Roldán.

⁷ S. E. Morison, *op. cit.*, p. 564.

⁸ *Ibid.* p. 567. There is a great deal of confusion in the literature regarding the *repartimientos* and *encomiendas*. In some cases the two are regarded as referring to the same institution, implying that land grants and grants of Indians (*repartimiento de tierras* and *repartimiento de Indios*) went together. Such was apparently the case in Hispaniola as described by Morison. Each settler, he says, was allotted a plot of land consisting of ten thousand cassava plants, "with the Indians that were on it." p. 567. Usually, grants of land and grants of Indians were separate acts. The *encomienda* strictly came to mean a grant of the right to the labor of a population of Indians. Naturally, in an agricultural country, this would involve use of the land as well. But grants of land were usually in perpetuity, while *encomiendas* were limited to the life of the grantee and the "life of one

The *encomienda* in Cuba was important for only a brief period in the beginning of settlement. It appears from the historical accounts that the colonists were more—much more—concerned with the exercise of their rights to the labor of the Indians than they were in discharging their responsibilities of feeding, clothing and educating them. Being a rather peaceful and easy-going race, unaccustomed to hard physical labor, the natives could not endure the regime of the Spanish masters. In the space of little more than a generation they were practically extinct, killed off by overwork, malnutrition and disease.⁹

Comparatively little land was distributed during this period, because settlers were few. The great attraction to the Spanish emigrant during the sixteenth century was the continent, where the gold and silver riches of Mexico and Peru had been discovered. Since the primary interest of the Spanish conquerors was to obtain gold rather than land, attention shifted sharply away from Cuba. It was partly due to threats of his followers to desert him that Velasquez, the conqueror of Cuba, distributed *repartimientos* of natives in the first instance.¹⁰ From the very beginning of the *repartimientos de Indios* in Cuba, however, the strong voice of Father Bartolome de Las Casas registered repeated protests with the Spanish sovereigns regarding the maltreatment of the natives. His protests, along with those of others, bore fruit in laws calling for the liberation of the natives in 1542.¹¹

heir." (See quotation from a Cédula of Phillip II in Simpson, *op. cit.* (frontispiece).

⁹ Ramiro Guerra y Sanchez, *Manual de Historia de Cuba*, pp. 44-45, 53-54.

¹⁰ Ramiro Guerra y Sanchez, *Historia de Cuba*, 2d. ed. Habana: Libreria Cervantes de Ricardo-Veloso. 1922 Vol I. p. 190.

¹¹ Orders of the Crown to "grant liberty judiciously to the Indians' advantage" passed April 20, 1843, were sent to Juanes de Avila but were not put into operation. His

(Footnote 11 continued on page 368)

But this victory for the good Father came unfortunately after the natives had largely been exterminated. They have no known descendants today.

The period of the *encomiendas*, because of the cruel annihilation of the aborigines, had important consequences for subsequent Cuban history. The elimination of the native labor supply set the stage for the entrance of slavery. This meant the introduction of Negroes, who because of their physical vigor and adaptability to the sub-tropical climate, made possible the extensive exploitation of agricultural and other resources. The demand for Negro slave labor on the part of Cuban settlers came even before the end of the *encomiendas*. An appeal for a license to import slaves was made in 1530 and by 1544 Negroes were said to be numerous in the Island.¹²

The Mercedes Granted by the Cabildos. During the two centuries from 1536 to 1729, most of the land of Cuba was alienated by means of grants, or *mercedes*,¹³ made by the municipal council (*cabildos*). Most of these grants were circular in shape with a specified radius (one, two, three, or more *leguas*) from a given center. Under the terms of the grants the grantee was obligated to make use of the property, to maintain an inn for travelers at the center thereof, and to supply meat for the

municipality at a price to be fixed by the *cabildo*. The *mercedes* were devoted to the production of livestock. Those used for cattle (*genado mayor*) were called *hatos* and were usually larger than those used for sheep or goats which were called *corrales*.¹⁴

How the circular form of the merced originated is not precisely known, although the place of its origin seems to be well established as Sancti-Spíritus. Here the first merced was granted by the *cabildo* on August 12, 1536 to one Fernando Gómez. Because of its historic significance the application and the action of the *cabildo* are quoted herewith:

"I, Fernando Gómez, resident of this town of Sancti Spíritus, appear before Your Honors and state: that mindful of it having been circulated by dispatch that all residents who should so desire might request crown lands, which shall be given them in the manner of a gift, they obligating themselves to pay for development of the town and supplies for its citizens: and mindful that I have a large family and there being sufficient crown lands, I state: that around the West toward the South there is a savannah, close to a ridge of mountains, about twenty leagues more or less from this town which they call Manicaragua, or, by another name, La Sabana de la Cabeza, where a river has its source that they call Arimau, which runs to the southern sea, and from there continue other savannahs called La Sabana del Oro, La Sabana de la Yegua, Mauricio, and another, Redonda: I ask that Your Honors grant me, in the name of the king, our lord, three leagues round about,¹⁵ in order to settle them when it be my

(Footnote 11 continued from page 367)

successor, Antonio Chaves was likewise opposed to the liberation and appealed for approval of his modification of the order to prohibit forced labor of Cubans in mining. The governor who followed him, however, Dr. Gonzalo Perez de Angulo, arrived in Santiago in November 1549 and immediately proclaimed the "entire liberty" of the Cubans. See I. A. Wright, *The Early History of Cuba*, pp. 178-185 (New York: The Macmillan Company, 1916). "From this time forward the natives cut little figure in the history of the island . . . Angulo's pronouncement seems to have had effect: in 1556 his successor, travelling through the country, said he found the Cubanos living wretchedly, abandoned to the wilderness. He estimated their number then and a little later to be not as many as two thousand, including perhaps two hundred Indians who were not native born . . ." *Ibid.*, pp. 185-186. The "New Laws" of 1542 nullified grants in *encomienda* but they were revived in 1547 with additional safeguards against mistreatment of the natives. (See Weeks, *op. cit.*, p. 158)

¹² Ramiro Guerra y Sanchez, *Historia de Cuba*, pp. 367-368.

¹³ The word *merced* means gift or grant in this case and came to be applied to these *cabildo* grants because they were free gifts with only minor conditions attached.

¹⁴ If an owner of an *hato* wished to devote part of his hacienda to breeding sheep or goats, it was necessary for him to get permission from the *Cabildo*. The area designated was then called *corralillo*. Similarly the owner of a *corral* who wished to produce cattle would have to get permission and the area of his corral devoted to this purpose was called *hatillo* or *hatico*. See E. T. Pichardo y Jiménez, *Agrimensura Legal de la Isla de Cuba*. 2nd. ed. p. 265. Habana 1902.

¹⁵ The Spanish phrase is *tres leguas en contorno*, which is rather ambiguous, but which could be taken to mean a circular shape, apparently 3 leagues in radius. If it were

(Footnote 15 continued on page 369)

convenience, without limitation of time, naming as principal seat La Sabana de las Cabezas on the banks of the Arroyo Oro, and upon your making me the grant I shall give a hundred ducats for public works and a hundred that a church may be raised. Wherefore I ask of Your Honors and beseech that you make me the grant I ask, since it is without harm nor hurt to anyone, and I swear that my petition is not in malice.—Fernando Gómez. The Cabildo having met, after agreeing on another matter, the following was set forth in the minutes of the session:—

"The petition of Fernando Gómez having been viewed by Their Honors, and there being no petition or grant made, nor any settlement other than the site of Asno, which does not cause any detriment to it, Their Honors stated that, in the name of the King, they do make and have made to said Fernando Gómez the grant of three leagues round about and that the principal seat be La Sabana de la Cabezada, on the bank of the Arroyo Oro, and the Procurator may place it in his possession; and first of all that he produce the two hundred ducats, so that a hundred may be given to the steward of the church and the other hundred enter the depository of the town; and having nothing else to review, this Cabildo was closed on said day, the 12th of August, 1536, as signers, &."¹⁶

Before this historic act on the part of the city council of Sancti-Spíritus, use was made of the circle to describe a piece of property in 1522. The situation arose in connection with the change of location of the village from its original and undesirable site, to a new one. To make this new site available one D. Maria Jiménez ceded an area of land to the village, described as being "one league in radius from the hacienda Minas."¹⁷

This first grant on the part of the cabildo of Sancti-Spíritus was given without specific royal authorization, and it

was not until the Municipal Ordinances of 1574, approved in 1578, that the crown recognized officially these acts on the part of the cabildos. Although other municipalities apparently had authority to make these mercedes, only those of Sancti-Spíritus and Havana did so; the former for the eastern part of the island, the latter for the western part.

In addition to the circular outline, there was another aspect of these haciendas of very great interest. This was the fact that they gradually evolved into communal properties; that is, properties held without subdivision by a number of claimants. This is one of the most interesting phases of Cuban land history. The *haciendas comuneras* arose from the fact that when the original grantee died or sold part of his merced, the new owners (his heirs, creditors, or buyers) did not subdivide the land. The reasons why the haciendas were not subdivided are not difficult to find. In the first place technical personnel to survey the land could not be obtained. In the second place the cost of such survey in relation to the value of the land would have been prohibitive. Finally, with livestock as the main enterprise, it was undoubtedly more economical to operate the hacienda as a large unit than it would have been to break it up into smaller and less economic areas. The latter would have placed each owner under the necessity of building his own corrals, dwellings, etc., an expense in those days too great to be borne. In other words, it was good sense from an economic point of view to keep the larger unit intact.

As an alternative to getting title to a specific portion of the hacienda, persons

(Footnote 15 continued from page 368)

meant to be a square it would undoubtedly have been so indicated, and moreover there would have been little point to specifying a center. For methods of surveying the circular form, see the author's forthcoming book, *Rural Life in Cuba*. Briefly, the device was to survey a polygon of 72 sides.

¹⁶ Pichardo, *op. cit.*, p. 260-261.

¹⁷ Esteban T. Pichardo y Jiménez, *op. cit.*, p. 260. As a footnote on page 261 this same author states: "Note that in this request [of Fernando Gómez], the most ancient of the island, already is determined the circular figure, because it was the most natural." (Translation and italics are the present author's).

with rights in the property were given what came to be called *pesos de posesión* or *pesos de tierras*. This practice was especially common in the eastern part of the island. According to Pichardo, "this system of community that had its beginning at the end of the Sixteenth Century in the territories that today are included in the provinces of Santiago de Cuba (Oriente), Puerto Principe (Camagüey) and almost all of Santa Clara (Las Villas); was not extended to the west in the Provinces of Matanzas, Havana and Pinar del Río."¹⁸

In the latter provinces, the co-owners of mercedes would mark and brand their livestock so as to designate ownership. The various individuals who came to have rights in the land and used it communally, each kept his own livestock distinct from the others by means of marks and brands. New owners were allowed to establish new seats or centers for their operations which were called *hijas* (daughters) of the principal hacienda. The heirs of these owners could in turn establish centers which were called *nietas*, or "grandchildren" of the original ranch.¹⁹

Thus, during this period, property rights in land became widely distributed among the people, although the physical division of land was characterized mainly by the communal haciendas. The boundaries of these mercedes were often no more than vaguely determined. The stage was set, therefore, for extensive litigation over land boundaries and titles. These disputes were not only among the circular haciendas, but also within them.

The Subdivision of the Circular Haciendas. The increase in the number of persons with rights in a given hacienda resulted in a steady diminution of the returns per capita. Some had larger shares than others, naturally, and the larger owners

were anxious to sub-divide, but the small ones resisted it, being reluctant to risk the loss of even such meager returns as they were now receiving. However, it is considered likely that even before the close of the 16th century some subdivision was taking place.²⁰

But if the internal forces were fomenting the movement toward subdivision of landholdings and the break-up of the communal haciendas, there was an even more powerful force operating from without. This was the rise of the sugar and tobacco industries. Although the cultivation of cane began in Cuba during the last decade of the 16th century, its growth was slow for several reasons, including the scarcity of slaves, the limited market, and the tremendous cost of getting the equipment needed for the extraction of the juice. This equipment had to be purchased in Portugal but, since trade of Cuba with Spain was limited to the port of Seville, everything went through that port and many middlemen got commissions on goods before they landed in Cuba. The importation of slaves was also a monopoly which brought the cost high to the Cuban buyers. These impediments meant a slow growth for the sugar industry and, moreover, it meant that the industry for a considerable time was founded on small enterprises, owned and manned largely by native white settlers, already established on the land. Their sugar mills were small and drew the cane which they processed from only a limited area. But sugar cane meant a substitute crop for livestock which up to then had been about the only commercial product from Cuban land. Most important, it meant the plowing and cultivation of much land which previously had been used for grazing: in other words, an invasion of a

¹⁸ *Op. cit.*, p. 279.

¹⁹ *Op. cit.*, p. 280.

²⁰ Ramiro Guerra y Sánchez, *Azúcar y Población in las Antillas*, p. 498.

new land use pattern into the old haciendas.

A similar development took place with the introduction of tobacco-raising in the 17th century. As Guerra points out, the tobacco fields grew up "within and at the expense of the communal haciendas" and thus constituted an additional factor in their dissolution.²¹

This stage was in a sense a transitional one from the economy of the large livestock ranches to one of field cultivation in which tobacco and sugar cane were the chief crops. However, the growth was gradual, and the conditions of its development were such that a comparatively broad basis of land ownership prevailed.

The Expansion of the Sugar Production. The great social and economic upheavals of eighteenth century incident to the application of steam power to industry, as well as the French and American revolutions, were destined to produce profound changes on the land use and land tenure patterns of Cuba. The application of steam power vastly increased the efficiency of the methods of processing sugar cane on the one hand and, on the other, enlarged the area which a single mill could serve by virtue of the introduction of railroads for transporting the cane, where hitherto the ox-team and cart had served. Moreover, relaxation of trade prohibitions on Cuba came during the reign of Carlos III of Spain, who was ready to make some concessions to Cuba in order to retain its loyalty since it was apparent that the colonial empire was rapidly dwindling away. Thus new markets were opened which had hitherto been closed. In addition, the achievement of independence on the part of the Anglo-American Colonies likewise freed those colonies from the imperial restrictions under which they had been held and

immediately opened a considerable free market at the very door of the island.

Yet, as is perfectly clear now to students of Cuban economic history, the decisive factor in sugar expansion at that time was the successful uprising of slaves in Haiti in 1789, which was precipitated by the Revolution in France. The importance to Cuba lies in the fact that Haiti had been the chief supplier for Europe of two commodities—sugar and coffee—which French capital developed there on the basis of slave labor on its large plantations. Only the force of the French military power made possible the exploitation of so many people by so few. Once that power was withdrawn, the whole structure collapsed, and the enslaved blacks took control. During this uprising, the plantations and mills were destroyed. As a consequence of this sudden wiping out of the main source of supply for the European market, prices rose rapidly. From 1790 to 1795 the price of sugar increased from 4 *reales* per pound to 28 and 30 *reales*.²² It was likewise a golden age for coffee production, while the new American market also absorbed many other Cuban products, especially fruits and vegetables. Thus the area of cultivated land increased at a rapid pace. Forests were rapidly cut down to make way for planting crops. The free importation of slaves, which was now permitted, resulted in a rapid increase of the human population to be fed, along with the additional work animals required by the new use of the land. Consequently, much emphasis had to be given to the production of human food and livestock feed. It was, in short, a diversified agriculture which came into being, although the cash crops were mainly cane, coffee, and tobacco.

The demand for land for these pur-

²¹ *Op. cit.*, p. 51.

²² See H. E. Friedlaender, *Historia Economica de Cuba*, (Habana: 1944), p. 112.

poses knew no bounds. The break-up of the communal livestock ranches was accelerated. According to Guerra, one of the large, new-type sugar mills now required 40 caballerías (about 133 acres) of land. However, enterprises of this magnitude were not usually *latifundia*, since cane was produced largely on individually-owned lands. The flowering of the latifundium in its grand form was yet to arrive. Guerra summarizes the situation thus:

"While the individual interest tended energetically to the dissolution of the communal haciendas and the division of large rural estates, the Spanish state did not maintain itself aloof from this intense movement; on the contrary, it stimulated and favored it with all its efforts in several ways. In the first place, the general and extraordinary Cortes of 1813, by decree of January 4 of the same year, ordered the reduction to individual property of all the uncultivated land (*terrenos baldíos*) and crown lands (*realengos*), dividing part among the servants of the nation as a patriotic reward, part among the settlers who did not own land and who asked for it, and setting aside the remainder for sale on easy payments to retire the national debt. In the second place, provisions were decreed to guarantee to proprietors the free ownership of their land in perpetuity, resolving all doubtful questions in regard to titles in favor of the possessor in good faith, and finally, was approved, the consultative vote of the Court of Puerto Principe (now the Province of Camagüey) of April 1, 1819, establishing an easy procedure, rapid and economical, for the division of the haciendas, subject to the encumbrances of the community. Thus, promoted by individual interest and favored and vigorously pushed by the colonial government, the two first decades of the Nineteenth century witnessed the dissolution of numerous communal haciendas and the partition of numerous latifundia, creating in Cuba, in those years when the whole continent was in rebellion against Spain, the most numerous, strong, well-to-do and enterprising class of rural proprietors, that we have had up to the present . . . If the material development

brought an increase in the colored population, principally of slaves, to its highest point, it had not produced a concentration of property, but accentuated the secular process of division and multiplication of it. The Cuban agriculturist was strongly established, and Cuba counted thousands of families solidly organized, rooted in land which they owned, the cultivation and use of which they directed personally; well-to-do people on the average, desirous of progress, of political autonomy and of playing the preponderant role in their country to which they were entitled by their culture, their stability and their individual and collective value . . ."²³

Rise of the Sugar Latifundia. The fifth phase in the evolution of Cuba's land tenure pattern began with the termination of the Napoleonic wars. The expansion of sugar cane was stimulated by the various factors already mentioned, but until well after mid-century, it was achieved through the establishment of new mills, rather than by enlargement of areas tributary to existing mills. These mills were still relatively small, although operated by steam.

The immense task of transporting cane to the mills by oxen, plus the additional new job of cutting down timber for fuel and carting it to the mills—also by oxen—automatically limited the area which could be served economically by a given mill. Guerra says that a single *zafra* (cane harvest) required the cutting of entire forests for fuel. While the latifundium was not yet to come in all its glory, most of the factors necessary for it already existed, including a supply of slave labor, the steam-driven mills, and an abundance of land suitable for cane.

One factor was absent—the railroad. Invented in England in 1826, it was introduced into Cuba on a limited scale some ten years later. However, its use by the sugar mills was not on any important scale until the end of the 19th century, owing primarily to the high cost of rails. But when the prices of steel rails

²³ Guerra y Sánchez, *op. cit.*, pp. 58-59.

in the United States declined from \$106 per ton in 1870 to \$44 in 1878,²⁴ construction of railroads was greatly stimulated, not only for use by the mills themselves, but for the public as well. Then began very active competition among the mills for larger supplies of cane, and prices paid to the independent colonos advanced rapidly. And in order to secure an adequate supply of cane for efficient operation of the larger and more efficient mills, the latter resorted to the acquisition of as much land in the neighborhood as they could obtain through purchase or otherwise. However, until after the War of Independence, automatic limits were set on this expansion by the restricted market and by the difficulty of securing adequate capital.

Nevertheless, while the sugar latifundia were still to expand and undergo internal modification as regards the organization of production and, while the small land owner and worker were to be pressed to new low levels of existence, the developments subsequent to 1900 were mainly the extension and elaboration of the forms which were fashioned in the social and economic matrix of the twenty-five-year period from 1870 to 1895. During this period, many technological advances were made in the industry, including the introduction of the railroad on a significant scale, improvements in the milling processes, and in the general organization of the industry. These changes were impelled not only by the new inventions themselves, but by a need within the industry to reduce its costs of operation. Sugar prices were at low levels, averaging only about half as much as they had been from the period from 1820 to 1870.²⁵ Any profits therefore had to come as a result of further

rationalization of the production process itself.

Throughout most of this period production fluctuated around 500,000 long tons per year but during the five years from 1890 to 1895 it increased from 632,386 to 1,004,264 long tons.²⁶ There was therefore a great expansion in the land devoted to cane production, although the number of mills declined from 1190 in 1877 to 207 in 1899.²⁷ Thus the way was prepared for the more dramatic expansion which came after 1900.

With the conclusion of the War of Independence new conditions appeared. There was, on the one hand, the general period of prosperity which prevailed throughout the world and in which agricultural products shared. The first two decades of the 20th century are frequently called the golden age of American agriculture, when farm prices compared most favorably with the prices in industry. There was an expanding market for food products and Cuban sugar was destined to share in it. In addition, the Platt Amendment which governed relations between the United States and Cuba granted the former the right to interfere in internal affairs of the new republic, which had the practical effect of assuring internal political stability. This relieved American capital of any fear for the security of investments which they might make in Cuba based on political uncertainty. Capital thus flowed generously into the Island, chiefly from the United States, but also from England, Spain, Canada, and other countries. Although production of sugar increased, the number of mills declined further from 207 mills in 1899 to 170 mills in 1915. Since then the number of mills has remained rather stable, varying from 184 in 1926 to 173 in 1943.

²⁴ Guerra y Sánchez, *op. cit.*, p. 77.

²⁵ See Friedlaender, *op. cit.*, p. 545.

²⁶ Guerra y Sánchez, *op. cit.*, p. 262.

²⁷ Friedlander, *op. cit.*, p. 431.

After the rehabilitation of the industry following World War I, production rose until a peak of 5,812,000 short tons was reached in 1925. At the same time the acreage devoted to cane increased accordingly. In 1940 it was estimated that 2,285,000 acres were devoted to this crop, constituting 57 percent of the total cultivated area.²⁸

The revolution from the standpoint of land tenure occurred in the distribution of ownership of land. As we have noted previously, in order to be assured of an adequate supply of cane for the mills, sugar companies acquired land on an immense scale. With adequate capital at their command, companies and individuals purchased land in great quantities until, in 1925-26, it was reported that the *centrales* owned about 20 percent of the total area of Cuba. Thus the comparatively numerous small proprietors of cane farms were largely, although not entirely, eliminated. Many of them sold their land but remained as sugar *colonos* who rented company-owned land. Those who retained ownership of their farms in the area tributary to the mill were dependent upon the sugar company which owned the railroads that transported their cane to the mill. That is to say, the *colono* was no longer in a position to choose among several mills as a market for his product, as had been the case in the days of the numerous small *trapiches*. Competition among mills was practically eliminated. Some mills operated on a basis of 100 percent "administration cane," that is, they had no independent *colonos* producing for them, either as renters or owners. For the labor supply, workers at low wages were imported from Haiti, Jamaica and other Caribbean Islands.

The organization of the industry passed largely from the hands of individual entrepreneurs to those of large corporations, many of which were foreign. Thus the Cuban-American Sugar Company owned six *centrales* with 14,867 *caballerías*²⁹ of land; the Cuba Cane Sugar Company, 12 *centrales* with 10,844 *caballerías*; the General Sugar Company and its dependents, 9 *centrales* with 8,972 *caballerías*; the United Fruit Company, 2 mills with 8,578 *caballerías*. These four companies own about 25 percent of the Cuban land in the hands of *centrales*.³⁰ American-owned mills account for about one-half of the production since World War I; in 1940, for 56 percent.³¹ Mill ownership by nationality in 1940 was as follows:³²

United States.....	67
Cuba.....	55
Spain.....	33
Canada.....	10
Britain.....	4
France.....	3
Netherlands.....	2
<i>Total</i>	174

Friedlaender³³ points out that the transition of Cuba from the status of colony to national independence coincided with the latest phase in the development of economic capitalism, the features of which were mass production, financial concentration and combination with international ramifications, and colonial imperialism. Powerful groups in the form of trusts, cartels and pools, both vertical and horizontal, national and international dominated the scene beginning with the 1880's and influenced the policies of governments.

With the end of the War of Independence, Cuba constituted a favorable environment in which this constellation of

²⁸ Paul G. Minneman, "The Agriculture of Cuba," p. 16, *U. S. Department of Agriculture, Foreign Agriculture Bulletin* No. 2, December 1942.

²⁹ A *caballería* equals approximately 33.16 acres.

³⁰ Guerra y Sánchez, *op. cit.*, pp. 94-95.

³¹ Minneman, *op. cit.*, p. 25.

³² *Ibid.*, p. 25.

³³ H. E. Friedlaender, *op. cit.*, p. 471 ff.

forces might and did operate. There was the rise of the large banking institutions, the great sugar centrals, the construction of the central railway, electrical development; and with these the rise of a wealthy class in the cities who built elaborate homes in the suburbs of Havana.

Evidences of wealth were notably confined to the limited class of entrepreneurs of these various establishments. The other side of the shield was not so bright. Many classes suffered loss, while the new class was emerging with its immense gains. Ramiro Guerra³⁴ has indicated that with the expansion of the sugar latifundia, made possible by the new technical developments incident to the industrial application of steam and the extension of railroads to haul the cane, the peasants lost possession of their lands. The sugar companies purchased land from the peasants, where the latter could show a title, but where titles were in question—as so many of them were—recourse was had to the courts. There can be no doubt that the contest in the courts was a one-sided affair in which the companies had the overwhelming advantage. They could employ the best lawyers who knew the multifarious loopholes in Cuban land laws. They could if necessary corrupt the officials, high and low, with bribes. Many colonos sold or otherwise lost ownership of the land, and as Friedlaender says, became tied by a "triple bond" to the mill: they were dependent upon it for land to rent, for the milling of the cane, and for credit.³⁵

Another class of victims of the new order was that composed of the small sugar mill operators. Before the development of the railroads for hauling the cane, the area which could be served by a particular mill was limited by the relatively short distance over which it was feasible to transport cane by ox-cart.

Moreover these small mills were made obsolescent by the new technical developments in milling sugar, involving new and more efficient machinery which was driven by steam power. Obviously, the small *trapiches* could not compete with the new and vastly more efficient *ingenios*. Thus, the drastic decline in number of mills referred to above. Meantime, while the number of mills was declining drastically, the sugar production of the Island mounted steadily, reaching a peak of nearly 6 million tons during 1925—nearly six times the production reported in 1902.

The expansion brought new insecurity to the owners of rights in the communal haciendas. While such rights were not always of very great value in actual gain to the individual, they were recognized as legal and large numbers of peasants enjoyed a measure of economic security in their *pesos de posesión*. But the demands for additional sugar lands brought about the sale and consequent subdivision of most of the remaining haciendas. Thus a new group of landless farm people was created.

Era of Government Intervention. The significance of the inauguration of government controls over agriculture, as far as our present purpose is concerned, lies in the impact of these controls on the use and ownership of land. After the "dance of the millions" of the 1920's, when sugar production and profits reached an all-time high in Cuba, the sugar market was glutted and governmental intervention toward restriction of production began. The first step was taken in 1926. At that time it became apparent to some of the mill owners and colonos that the frenzied expansion of sugar production had reached the point where serious difficulties could be foreseen if and when prices declined. The Verdeja Act, passed

³⁴ Ramiro Guerra, *Azúcar y Población en Las Antillas*.

³⁵ Friedlaender, *op. cit.*, p. 471.

on May 3, 1926, called for a 10 percent reduction in the estimated crop of sugar for that crop year and provided further that, for the 1927 crop, total production should be limited to four and a half million tons and the grinding date delayed to January 1. Each mill received a quota roughly proportional to what it had expected to realize. These measures were partly responsible for a rise in sugar prices to a point above 3c in the early part of 1927. By 1928 it was clear that the world-wide expansion in sugar production without corresponding reductions in competitive areas as well as in Cuba would result in a surplus and a disastrous reduction in price.

The Sugar Defense Act of October 4, 1927, provided for: (1) a National Sugar Defense Commission to advise the President to prepare annual estimates of the amount of Cuban sugar required in foreign countries and recommend the degree and character of restrictions to be imposed over the six-year period, and to attempt to negotiate agreements with other countries. (2) A sugar-export company to which all mill owners would belong which would control all sugar marketed outside the United States and Cuba and which would administer a system of production quotas. Under this Act Cuba reached an agreement with Germany, Czechoslovakia, and Poland, as to quotas and agreed to reduce its own crop in 1928 to 4 million tons.

The next significant step in the direction of government intervention was the development of the so-called Chadbourne Plan adopted by the Cuban Congress and promulgated on November 15, 1930. The essential features of the plan were: (1) The segregation of one and a half million tons of sugar to be turned over to a new Sugar Export Corporation and marketed outside of the United States and Cuba over a five-year period. (2) The

segregated sugar was to be paid for at once by the issuance of up to \$42,000,000 in bonds. The bond issue was secured in the first place by the sugar bought at \$4.00 a bag; second, by a tax of 11c a bag on sugar produced in Cuba during the next five years or to the end of 1935; and by a further tax of 50c a bag for the succeeding five years, if necessary; and finally, by the unconditional guarantee of the government. (3) A third feature was the authorization of the President of Cuba to fix the quantity of any Cuban crop provided there were international agreements between producers; to fix it during five years at the request of 65 percent of the mill owners who produced 65 percent of the preceding crop, and to fix a quota for the United States irrespective of such prerequisites. Finally, until December 31, 1935, no sugar could be exported from Cuba without permit from the Export Corporation issued in conformity with the law.³⁶

These measures drastically influenced Cuban land use. In the first place, the earliest act, the Verdeja Act, forbade the further cutting down of virgin forests for the expansion of the cane fields. The unrestricted competition which characterized the expansion of the sugar industry in the period following World War I took no account of the public interest in respect to conservation of the natural resources, particularly timber.

In the second place, reduction of the sugar cane acreage necessarily meant unemployment for thousands of people who were dependent upon the sugar industry for what little income they enjoyed. It led the government as well as farmers themselves to attempt to find alternative ways in which to use their land. Coffee growing, which had long been in a moribund state, was given a new lease on

³⁶ For an excellent brief discussion of this period of governmental intervention, see *Problems of the New Cuba*, pp. 240-263.

life by a high protective tariff. The high tariff act of 1927 also greatly stimulated production of dairy products, meat, poultry and eggs, and potatoes. But one of the most dramatic changes took place in coffee production. In 1925 Cuba imported 12,972,000 kilos of coffee but, by 1933, the importation amounted to only 58,600 kilos. Although Cubans drink a great deal of coffee, their wants are supplied now mostly by domestic production and frequently there is some exportation.

The depression of 1930 was a major disaster to Cuba because it had geared its whole economy to the sugar industry which was in sore straits. Voices of agrarian reform were raised with increasing force and, in 1933, culminated in the revolution which unseated President Machado and brought new elements into control of Cuban politics.

On December 23, 1933, the government of Dr. Ramon Grau San Martín issued a significant decree which said in part:

"The intense world crisis of overproduction has shown the necessity of regulating production in accord with consumption and has obliged the principal nations to substitute a policy of intervention and control, for that of free trade.

"It is a purpose of this revolutionary government to practice measures that will tend to make prevail the general interests of the nation regardless of the advantages that private interests may have in disposing freely of the factors of production. The measures of restriction and control promise to serve as a pattern for reaching agreements of a world character, which will give our industry more stability."

This statement heralded the beginning of a long series of governmental actions which have profoundly modified the Cuban economy. For one thing, there was a renewed emphasis on measures to protect the small farmer and the worker. Renewed animus became evident toward

the foreign land-owners, especially the big ones. If some of the measures could be regarded as punitive from the standpoint of the *latifundistas*, it was but a comparatively mild expression of a profound passion of peasants to possess the land on which they work—a passion common to land workers the world over which in many times and many countries has flared in much more violent form.

The *Ley de Coordinación Azucarera de 1937* and the supplementary regulations set forth in minute detail the rights and obligations of the various producers and laborers and the sugar mills. The distribution of production quotas, the price to be paid for grinding, the amount of rental to be paid for the use of the land, the wages to be paid for labor, and procedures for administration and arbitration are minutely set forth. The distribution of the product is defined not in terms of money but in terms of the yield of sugar. The law established a minimum wage of 80 cents (subsequently revised upward) per 8-hour day for wage workers, but specified that the daily wages during the crop period should be the value of 50 pounds of sugar, polarization 96. The minimum wage becomes effective should the value of 50 pounds of sugar fall below it. Even during the "dead season," when the workers may be engaged in off-season activities, the same regulations apply. The price of sugar used is that of the last semi-monthly average. Employers and workers of course may collectively agree to wages in excess of those established in this manner.³⁷

The provisions of the Act with respect to wage labor were effectively supported by an article in the Constitution of 1940

³⁷ For an excellent review of recent developments in the sugar industry see José Antonio Guerra y Debén, "La evolución económica-social de la industria azucarera en los últimos años," in Ramiro Guerra y Sánchez, *Azúcar y Población de Las Antillas*, 3d. ed. (Cultural, S. A., Havana, 1944), pp. 281-315.

which forbids the importation of contract laborers. (Article 76) Previously it was the common practice to import laborers from Haiti and Jamaica for the cane harvest at wages said to be less than the Cuban worker needed to support even his meager standard of living.

The rent paid for the use of land by the colonos is geared to the price of sugar, rising and declining with price changes. The price figure used in the computation is an average of the official average semi-monthly prices for the calendar year as published by the Ministry of Agriculture for the particular port from which shipment is made. In other words, rent is paid in a share of the sugar rather than in cash. The system is somewhat complicated, but essentially it is as follows:

1. Land occupied by a colono is classified three ways. Area A consists of the area actually planted to cane; Area B is additional land equal to from 50 to 30 percent of Area A, depending on the size of area A. The larger Area A is, the smaller is the percentage used in computing Area B. Area C includes all other land in the *colonia*.
2. Rent for Area A land amounts to 5 percent of the yield of sugar obtained by the mill. For example, if the average acre yield of sugarcane was 20 tons and extraction amounted to 12.5 percent, there would be 5000 pounds of sugar, 5 percent of which, or 250 pounds, would go for rent. It would represent a value at 3 cents per pound of \$8.75.
3. Rent on Area B land depends on the price of sugar. If sugar is worth only one-half cent a pound the rental would be \$10 per *caballería*. It advances \$10 per *caballería* with each $\frac{1}{4}$ cent per pound advance in the price of sugar. Lands which are irrigated pay a rent 50 percent higher than do those which are not irrigated.
4. Rent on Area C land is determined in the same manner as for Area B. However, these rentals apply only if no contractual

arrangement exists between the land owner and the colono.³⁸

One important effect of the application of the law was the establishment of protective measures against exploitation of the cane growers and the laborers. It accomplished this end in various ways; in the distribution of quotas and, to the "small planter" at the expense of the reduction of those of the "administration cane"—that is, cane produced by the sugar companies themselves. It provided that returns for each factor in the productive process—mill, renter, laborers, land—should be on the basis of the physical product and the price thereof, rather than in terms of money. It established machinery for handling complaints of either party to the contracts, and for reaching collective agreements. It also provided many other protective measures including the definition of rights of the colonos as to the occupancy and use of any lands dedicated to sugarcane production. It would be difficult to over-emphasize the importance of this provision which greatly restricts the rights of ownership. Under this provision a colono cannot be evicted so long as he continues to produce his quota of sugarcane. Thus, the farmer has in effect practically all of the advantages usually associated with ownership of land and at a rental which is nominal.

While the law also grants protection to the land owner, setting forth the conditions under which a tenant may be evicted—failure to practice good husbandry or fulfill the other conditions of the contract—it is clear from reading the *Regulations* that the intent of those who framed the law was first of all to protect the tenant against arbitrary action on the part of the landowner.

The Constitution of 1940 went so far as to prohibit large land-holdings. Article 90 if fully implemented definitely fore-

³⁸ See *Ley de Coordinación Azucarera, con las modificaciones introducidas por Ley de fecha 1 de febrero de 1938* (Cultural: Havana, 1938). Chapters II and IV of the law and Chapter IV of the Regulations are particularly pertinent.

shadows the end of the large latifundia when it says:

"Large landholdings are proscribed, and to do away with them, the maximum amount of land that each person or entity can have, for each kind of exploitation to which land is devoted, and bearing in mind the respective peculiarities, shall be specified by law.

"The acquisition and possession of land by foreign persons and companies shall be restrictively limited by law, which shall provide measures tending to restore the land to Cubans."

What of the Future?

Thus, in the long course of Cuban history the land that once was distributed widely among the inhabitants, either in the form of separate holdings, or in the communal ranches, became concentrated in the twentieth century in the hands of a few. The rise of the sugar *latifundia* was the dominant factor in this transfer of land ownership. In the formation of these large holdings the small proprietors were up-rooted from ownership of the land and at the same time the agriculture of the country was committed more thoroughly to a monoculture of such vast economic importance that it dominated the entire economy. Instead of a country of small proprietorships, Cuba became a land of latifundia. Instead of a country of "family farms," it became a land the rural population of which was composed predominantly of renters and wage workers. Instead of the relative security that flows from the production of diversified crops, there is the insecurity that comes from an economy geared to a single crop and a market dependent upon foreign consumption, a market chronically unable to absorb the immense production which has been made possible by technological progress and improved management.

Today, Cuba is trying to find an alternative to the speculative economy based on sugar. It is looking with nostalgia on

its past, when its peasantry possessed the land and was attached to it by a sense of property in it. There seems to be a feeling of guilt that they ever allowed the large sugar plantation to develop. The latter is regarded by many—some of whom are most vociferous—as a monster which must be slain. That part of the animus is due to foreign ownership is very apparent. Even though foreign owners are increasingly restricted the observer is led to wonder whether any attempt will ever be successful to sub-divide the estates held by the Cuban landlords. The latter are an important group and, while they may lend support to any program looking toward the elimination of the large foreign owner, they naturally will be less enthusiastic about seeing their own holdings broken up. Moreover, their influence over Cuban politics is such that they may very well be able successfully to oppose any movement threatening their own position.

A final comment may be in order. One observes in the discussion of the land question very little if any attention being given to the relative efficiency of the large versus the small holding. Small proprietorships, while representing an ancient ideal, are not to be regarded as an automatic guarantee of security and welfare in the modern world. In fact, the large sugar enterprises, because of superior efficiency and management, in all probability can be made to provide greater resources for the men who grow the cane than if it were divided into small holdings. The relative efficiency of the two systems ought to be given central consideration in the development of future land policies. It has been given very little attention in the past.

To say this does not mean that the writer is arguing for the maintenance of the status quo in Cuba. What seems to be in order for the Cuban people is

a less impassioned appraisal of their agricultural policy, with a view to making decisions on the basis of fact rather than fanaticism. The slogans and shibboleths associated with the big land owners, and with the demands of the peasants for land, while useful in the mouths of demagogues, are scarcely adequate grounds for overturning the whole economy. Cuba wants to improve the lot of the masses of its workers, not to impoverish them further. There is no magic land policy formula which is going to bring about this objective. Only intelligent planning based upon careful factual study will contribute to the goal.

This question of Cuban efficiency becomes increasingly important as the efficiency of competing areas increases. Reference has already been made to Cuba's reliance upon foreign markets, particularly the United States. Sugar production in the United States, whether from sugar beets or cane, has had to rely on a protective tariff in order to compete with Cuba and other areas. However, technological improvements are being made in both the beet and cane areas of the United States which may conceivably wipe out the previous disparity in costs of production. Meanwhile, technical changes in Cuba are made very slowly due to the opposition of the workers whose jobs are at stake. Therefore, unless it can be shown that breaking up the sugar estates is going to increase efficiency and thus keep the industry competitive with other sugar-producing areas, such a policy would only add to the difficulty of the problem.

This brief review has revealed the close dependence of Cuba upon influences outside her borders. The changes in the world market, the political fortunes or misfortunes of various parts of the world, the crises of war, the introduction of new technologies (the railroad, steam power,

the tractor, etc.) all have had a profound effect upon, and have wrought changes in, the land policies of the country. This can be said of any country, more or less, but it is particularly true of Cuba.

The way out for her is by no means clear. Feelings of national pride lead her to want freedom from economic dependence upon other countries. Her sugar market is overwhelmingly in the United States; and she is often in a weak bargaining position because of the threat or reality of surplus production. She has to compete with growers within the United States who enjoy the protection of a tariff, yet costs of production are becoming more nearly equal. Cuban workers are demanding more of a share in the product—and getting it. Yet in terms of natural endowments, in soil and climate, Cuba can scarcely be excelled as an optimum habitat for sugarcane. Were it not for the artificial trade restrictions imposed by nations Cuba might well be producing double or even triple the present output of sugar. There are thousands of square miles of land suitable to the production of cane which are now used for the production of beef cattle.

From an economic standpoint it would seem desirable that Cuba produce more sugar since she is so eminently fitted to do so, and buy other goods abroad. However, events of the past 20 years have turned her thoughts more and more in the direction of a policy of diversification and self-sufficiency. She realizes that the ups and downs of the United States economy, its booms and busts, spell only instability for her and misery for her people, especially if she adheres to a policy of extreme reliance upon one crop. It is this experience which has led to demands of the peasants for agrarian reform, for driving out the foreigner, for distributing the land among smaller holders, and for a national policy of partial food autarchy.

The development of greater economic stability in the United States and the lowering of barriers to international trade throughout the world would change the outlook of the Cuban people. In other words, the people of the United

States, in decisions which they make on these matters; directly affect the fortunes of the people of Cuba. The two countries are mutually dependent to a marked degree. Their problems should be dealt with as mutual problems.

The Stabilization of Investment in Two Public Utility Industries

By DAVID GORDON TYNDALL*

Introduction

IT is now a commonplace that "fluctuations in the various types of investment and demand for durable consumers' goods are a dominant factor in the problem of economic instability."¹ The conclusions which the League of Nations' committee derived from the foregoing statement, namely, that "any policy designed to prevent periodic depressions must, therefore, concentrate in the first place on attempting to stabilize or counterbalance these crucial fluctuations in investments," may not be so fully acceptable. Certainly it can be argued that attempts to stabilize consumption directly, i.e., other than by means of controlling investment, should have equal place with, perhaps a place even ahead of attempts to stabilize investment directly. What is needed of course is a broad approach to the problem of cyclical instability which will involve the use of many different tools of economic policy.

But this does not make unnecessary—indeed it makes all the more necessary—a careful study of each of the various categories of total spending in order to determine the action, if any, which can be taken to stabilize it. To the extent that any particular category of investment or consumption can be stabilized, the problem of cyclical instability will be lessened (unless, of course, the policy which stabilizes one sector destabilizes another sector to such a degree that the net effect is destabilizing).

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In this paper I wish to consider some of the problems involved in stabilizing investment in two public utility industries, namely, the electric power and telephone industries, not because success in stabilizing these industries will solve the problem of cyclical instability but because one must start somewhere and because, for reasons set forth below, the problems involved in stabilizing investment in these industries seemed somewhat less difficult than those which would arise in non-regulated industries.

The Importance of Public Utility Investment

The tables show clearly the importance of investment by public utilities in the interwar period, in terms both of its size relative to other types of investment, and of the amplitude of its fluctuations. In most years in the period it accounted for 15% to 20% of the total "income-producing expenditures that offset saving," varying from a low of 7% in 1936 to a high of almost 25% in 1930. Of private income-producing expenditures that offset saving, it of course accounted for a slightly higher percentage, varying from a low of 10% in 1936 to the 1932 situation in which private income-producing expenditures that offset savings were negative.

In absolute terms, gross investment in the utilities fell by more than \$2.2 billion, from the peak of 1929-1930 to the low point of 1933. This was a decline of over 80%. Compared to the decline in total income-producing expenditures that offset saving in the same period, the de-

¹ League of Nations: Report of the Delegation on Economic Depressions Part II, *Economic Stability in the Post War World* (Geneva: 1945), p. 74.

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cline in utility investment was slightly less severe, but if the more meaningful comparison with total plant and equipment expenditures is made, the surprising conclusion is reached that utility investment in plant and equipment had a greater percentagewise decline than investment in plant and equipment by other sectors of the economy.

Consideration of the individual series for the electric power and telephone industries shows that investment in both fields declined sharply from 1929-1930 to 1933, but that the decline was somewhat more severe in the electric power industry and somewhat less severe in the telephone industry than in the utility industries as a whole.

TABLE I—INCOME PRODUCING EXPENDITURES THAT OFFSET SAVING*
(in millions of dollars)

Year	Total	Total Private	Total Plant and Equipment	Total Utility (Including Railroad)	Electrical Power	Telephone
1921	9832	9183	5095	1305	288	230
1922	12113	11368	5666	1495	408	266
1923	17070	16707	7765	2560	738	320
1924	13169	12554	7542	2619	844	386
1925	16990	16463	8069	2325	787	387
1926	16498	16253	8934	2505	718	408
1927	15028	14662	8609	2445	738	399
1928	15803	15071	8749	2317	701	460
1929	17600	16907	11045	2757	793	620
1930	11270	9770	8307	2758	855	616
1931	8251	4467	5145	1701	555	411
1932	2460	-227	2834	886	265	255
1933	3014	1776	2433	506	120	167
1934	5215	2946	3459	680	137	180
1935	10600	7363	4390	749	179	195
1936	14783	10844	5995	1054	269	250
1937	15159	14358	7516	1549	424	349
1938	7866	5466	5462	1163	403	319

Source: Computed from Temporary National Economic Committee, Hearings Part 9, *Savings and Investment*, Exhibits 547-556, pp. 4010-4018.

* (1) The figures are "gross" not "net." (2) The difference between "Total Private" and "Total Plant and Equipment" is accounted for by the following: change in inventories, foreign-current account balance, private housing, nonprofit institutions, changes in consumer credit. (3) Plant and equipment expenditures of the various utility industries were not equally unstable but they all were highly unstable. The two most important industries, railroads and electrical power, showed the greatest instability.

TABLE II—INCOME PRODUCING EXPENDITURES THAT OFFSET SAVING AS RELATIVES, 1929=100

Year	Total	Total Private	Total Plant and Equipment	Total Utility (Including Railroad)	Electrical Power	Telephone
1921	56	54	51	47	36	37
1922	69	67	56	54	51	43
1923	97	98	77	93	93	51
1924	75	74	75	95	106	62
1925	96	97	80	84	99	62
1926	94	96	89	91	90	66
1927	85	86	85	89	93	64
1928	90	89	87	84	88	74
1929	100	100	100	100	100	100
1930	64	58	82	100	108	99
1931	47	26	51	62	70	66
1932	14	..	28	32	33	41
1933	17	11	24	18	15	27
1934	30	17	34	25	17	29
1935	61	44	43	27	22	31
1936	84	64	59	38	34	40
1937	86	85	75	56	53	56
1938	45	32	54	42	51	51

These facts lead one to the conclusion that the decline in investment by the electric power, telephone and other utility industries played a significant role in increasing the severity of the "great depression." The same cannot be said for the so-called minor depressions of the 1920's. In these, utility investment either increased or showed only a slight decline at the time that most other types of investment declined severely; this was also true for the years 1930 and 1938. Thus, judging from the experiences of the 1920's and 1930's, it would seem that in a minor depression utility investment plays a stabilizing role, whereas in a major depression it may decline seriously and increase the severity of the downward movement.

A study of the nature of investment in the utility industries provides a logical explanation of the divergent roles which utility investment played in cyclical movements of the 1920's and 1930's and

suggests that the same pattern will probably repeat itself in future cycles.

The Determinants of Public Utility Investment

There are four factors which serve to explain the pattern which the statistics reveal. They are:

- (1) The nature of investment policies in the utility industries, and particularly the failure to make or to implement long-range plans for construction of plant and equipment;
- (2) The length of life of plant and equipment in certain of the utility industries;
- (3) The length of the construction period for certain types of utility investment; and
- (4) The attitude of many of the regulatory bodies toward the problems of cyclical instability.

Much of the "cycle" literature of the last few decades has laid great emphasis on the thesis that current investment is not determined solely by changes in consumption in the present or in the immediate past.² Indeed it has frequently been argued that there is very little relationship between current investment and current changes in consumption. In certain fields of investment, this thesis may be reasonable, but in the field of public utility investment it clearly does not hold. This is not to say that changes in current consumption are the sole determinant of investment by public utilities. Technological advances and changes in the relative prices of certain of the factors have played and presumably will continue to play an important role in determining investment. Conditions in the capital market may also be of dominating importance at certain times. Moreover, many if not most utilities attempt to predict future demand

for their product by applying some type of statistical techniques and draw up their investment plans and determine current investment in the light of these predictions. But even where such projections are made (and frequently they are not made) they appear to be influenced to a very high degree by changes in demand in the preceding year or two.³

In recent months we have heard much of the long-range construction plans of many of the utilities. But, unless utility policy has changed drastically since the 1930's, the timing of these plans would be completely altered if the current prosperity were to be replaced by a major contraction in employment and income. For example, if demand for electric power were to drop drastically in the first half of 1950 so that the then existing capacity would be more than ample to meet current demand plus a "safety factor," further expansion would be curtailed as quickly as possible. Certainly if we rely on the statements of utility executives, this is what happened in the period 1929-1931. Investment by the utilities in 1930 was maintained at a level almost equal that of 1929 because of the necessity of *completing* many large projects; virtually no *new* projects were begun and in 1931, by which time the projects begun prior to 1930 were generally completed, investment expenditures by the utilities fell drastically. By 1932 investment expenditures by the utilities were insufficient in many cases to maintain the value of plant capacity.⁴ This close relationship between current changes in demand and investment, coupled with longevity of much of the plant and equipment in the utility areas, results in all

² See Alvin H. Hansen, *Economic Policy and Full Employment* (New York: McGraw-Hill, 1947), p. 189.

³ See *Report of the F.C.C. on the Investigation of the Telephone Industry in the United States*, made pursuant to P.R. No. 8, 74th Congress (Washington: 1939), p. 277.

⁴ This is a statement of fact and is not meant to imply any criticism of the decisions leading to the sharp reduction in gross investment, for in a capitalistic economy motivated by profits the managers have no other option when faced by large excess capacity. However, recognition of the fact may lead us to make such changes as to induce the managers to act in other ways.

too effective operation of the so-called acceleration principle during a major decline in income; however, during *minor* fluctuations in income, investment by the public utilities is maintained as a result of the length of the construction period and the inevitable lag between a change in demand and resultant changes in investment plans.

Needless to say, there is no simple mathematical relationship between the change in the quantity demanded and the amount of investment during a major cycle. The variability of the construction period in the industries is such that no such relationship could be expected to be found from statistical analysis of industry figures even if changes in demand for the product were the only determinant of investment decisions, which of course they are not.⁵ But it does seem that in the absence of significant changes in technology or in the relative prices of the factors, so long as demand for the products and services of the utility industries continues to increase uniformly (and they anticipate no change in that increase—a condition which apparently existed in the late 1920's), investment will be maintained at a stable level. If that increase slows down (and the new slower increase is expected to continue) the rate of investment will be reduced proportionally as quickly as is economically and administratively feasible. If the increase in demand ceases, or if demand actually declines, gross investment will be reduced after a time lag, which may be appreciable, to the minimum necessary replacements unless an early reversal of the movement is expected.

Possible Methods of Stabilizing Utility Investment

This is definitely one instance where explanation is not justification. The demand for the services of the electric power

and telephone industries is less income-elastic than that for the products of industry in general,⁶ and the danger of competition is much less than for non-regulated industries, so that if there are any fields of non-government investment where some greater measure of stability of investment is a practical goal, it is these; yet in the last major depression they were characterized by a more serious decline than similar categories of non-utility investment. It may not be possible to iron out completely the fluctuation in utility investment, but there seems good reason for making serious efforts to prevent the continuance of a situation in which, because of a cyclical decline in demand, net book value of plant is permitted to decline in an industry even though it is obvious that the long-run trend of demand for the industry's product is upward. It is perhaps in order to reiterate that (1) even complete stabilization of investment in the utility industries could eliminate only a small portion of total cyclical instability, — stabilization of investment by the utilities is not to be viewed as a panacea, (2) means must be found for stabilizing investment in all its forms, but that (3) *in this paper* we are limiting the analysis to means of stabilizing investment in two utilities.

The most logical approach to the problem of instability would be via stabilization of the rate of increase in consumer demand for the product. Of course even if it were possible to smooth out the demand perfectly, investment would still be affected by psychological and cost factors; nevertheless the fluctua-

⁵ See, however, Charles F. Roos and Victor S. Von Szeliski, "The Demand for Durable Goods," *Econometrica*, XI, 1943, where a fairly definite relationship was found for equipment in the electric power field.

⁶ Rough calculations made by the writer indicate that in the 1930's the income elasticity of demand for electric power (i. e., the ratio of the proportionate change in quantity demanded to a proportionate change in income) was about 0.25 and that for telephone service was about 0.5, whereas that for products in general was approximately 1.0.

tions in investment would be considerably reduced. The same reasoning applies, though with slightly less force, to all other areas of investment; certainly every policy which will lessen the fluctuations in final demand and which does not have significant destabilizing effects on other parts of the economy, should be given consideration, e.g., adequate unemployment insurance, etc. But so long as any fluctuation in demand remains, it will be magnified in its effect on investment, and the probability of anything approaching complete stabilization of the rate of increase in consumer demand in the foreseeable future seems very slight.

But if complete stabilization by operation on the demand side seems impractical, perhaps manipulation of a cost factor e.g., the cost of credit, would be an effective complementary policy. Certainly manipulation of the cost of credit may play some role in stabilizing investment in these utility industries where capital costs are so large a percentage of total costs. However, investigations of the significance of changes in the costs of capital⁷ indicate that the effect of reduction of long-term risk-free interest rates to zero would be slight even in these industries, particularly over the relatively short periods with which we are concerned in cyclical analysis.⁸ It is necessary, therefore, to consider a third possible method of stabilization.

To the extent that fluctuations in investment are the reflection of fluctuations in consumer demand, they could be elimi-

nated even though the consumer demand for the product were not completely stabilized over the cycle, if investment were geared not to the year-to-year cyclical fluctuations (any more than it is geared to the seasonal fluctuations in demand), but rather were geared to long-run projections of demand.

This policy would necessitate the construction of new facilities at times when existing facilities were in excess of current demand.⁹ It is this fact which gives rise to the serious problems set forth below:

1. The newly constructed facilities may never be needed because either (a) the projections of demand were over-optimistic so that by the time the facilities would be needed they would be hopelessly inefficient because of physical depreciation; or (b) though the demand projections were accurate, radical technological changes make the facilities unusable or unnecessary. In either case the construction of the facilities would involve waste of resources. And even if the projections were correct and no important technological changes occurred, the idle equipment would depreciate to a certain extent and would require certain minimum maintenance expenditures during its idle period.¹⁰

2. The facilities must be paid for. Specifically one faces the question: how are the interest, depreciation and other costs on the facilities to be met during their period of idleness?

3. There are the institutional problems: (a) will the necessary funds for the original investment be available to the utilities on reasonable terms; and (b) how can the policy be implemented in view of the present framework of regulatory procedure?

estimate of future demand is made. I shall assume that the total capacity will be geared to estimated demand at full employment in each successive cycle. The point raised in the first sentence of this note will be discussed further later.

¹⁰ There is a further cost, namely, the cost of waiting to use the resources which are embodied in the plant and equipment rather than using them immediately. In a world where all saving was based on consideration of time preference, this cost might be important; but given the distribution of income and the consequent nature of saving in our society, the cost is probably non-existent or negligible, i.e., the payment of interest is in large part a transfer and does not correspond to any real social cost. Admittedly the cost is real enough to the utility; this point is discussed later.

⁷ D. G. Tyndall, *The Interest Rate and the Problem of Secular Unemployment* (Doctoral dissertation on file in the University of California, Berkeley).

⁸ In depressed periods, means for making capital available at reasonable rates may be very important. This point is discussed in the section on *Institutional Problems*.

⁹ At certain times (e.g., the period 1946-1948) this policy may necessitate a rapid acceleration of investment followed by a decline to some "normal" level once the backlog of demand has been worked off. However, this fact is not so significant to the cyclical problem unless an attempt is made to restrict total capacity in the industry to a level adequate to meet average demand over the cycle, or a serious under-

4. There is the educational and psychological problem of gaining the support of the public and regulatory bodies for the idea of stabilization of public utility investment.

It will be noted that the matters raised in 1 and 2 are what might be called the real or fundamental problems and would be equally relevant in any society or any type of industry; whereas the matters raised in 3 and 4 stem largely from or at least are determined by the particular characteristics of the utility industry in the U. S.

The "Real" Problems

It is perhaps significant that the problems raised in 1 and 2 are much more easily handled than those raised in 3 and 4. While it is true that the suggested policy will inevitably involve some direct waste of resources—if comparison is made with use of resources in a perfectly competitive, full employment economy—the chances are very great that it will involve much less waste than continuation of present practices. Since the labor would have been unemployed had it not been used in constructing the facilities, the only real waste is the use of those natural resources and that equipment which otherwise would have been available for future use—in Keynesian terminology, the user cost to society. I believe it is obvious that in general this cost or waste will be much less than the

cost of idle labor, especially if the social costs are added to the purely monetary or material ones. Occasionally, for certain specific projects, the waste of natural resources, etc., involved in construction of new facilities when there is already excess capacity, will outweigh the wastes involved in not building; but these will be exceptional instances unless the tempo of technological change or shifts in demand are greatly accelerated. On the average, the suggested policy would result in a much more efficient use of resources.¹¹

But, it may be objected, this argument assumes that the labor which was formerly employed in the construction, installation, etc., of utility plant and machinery will be utterly wasted if employment falls in these fields. Since we are speaking of the problem which arises in a cyclical contraction this assumption seems warranted so long as we exclude governmental work projects as a possible means of employment. If we consider the possibility of employment on government work projects, it may be true—particularly in a severe and prolonged depression—that labor could be more effectively used in building roads, bridges, schools, etc., than in constructing additional utility plant which may be largely obsolescent by the time it is needed. This may be so despite the greater technical efficiency which the labor is almost certain to have in its usual sphere of em-

¹¹ This may be more evident if one reconsiders the resources which would be used up in the process of providing plant and equipment for the utility industries. Except for labor, which in most instances comprises more than 50% of total costs, the resources are those used in the making of steel, of cement or brick and to a much lesser extent, copper, aluminum, glass, wood, and various textiles. Of the more important of these, either our supplies are almost inexhaustible or recovery from scrap greatly reduces the ultimate net loss (e.g., iron ore, copper ore). If, as we have assumed, the labor would have been idle if the demand for these products from the utility industry had not been stabilized, it seems highly improbable that the net real cost to society of their production would exceed 10% of their average total costs.

The stabilization policy would then yield a net gain so long as losses due to obsolescence were less than 90%. In the past the expected useful life of plant and equipment in these two industries has been many times longer than the average length of the business cycle, and the rate of obsolescence in these industries has not been so rapid as to cause large-scale abandonment of plant before the expiration of expected useful life. Prediction of future relationships can be little more than enlightened guesswork, but unless the pace of technological change is speeded up very greatly, obsolescence losses as high as 90% seem extremely unlikely. When one considers also the non-material benefits which would be derived from providing workers with an opportunity to use their skills, etc., the chance that stabilization would mean a net loss to society seems utterly insignificant.

ployment as compared to its efficiency in public work projects.¹²

If energetic anti-cyclical policies are adopted in future contractions, it is unlikely that the depression will be so severe or so long as to result in a situation where the labor would be more efficiently used on public work projects than on utility facilities. But the situation is at least possible, and the possibility must be borne in mind in the determination of policy.

This raises the broad problem of the criteria to be used in choosing between various public works projects, a problem which I do not wish to discuss here.

Turning to consideration of who will pay for the inevitable costs of stabilization, it would seem most logical that the cost be borne by the public at large rather than by the consumers of the utility services. On the one hand the benefit will accrue to society at large and, on the other, neither the utilities nor their customers can be held responsible for the cyclical fluctuations in the demand for the utilities' services. However we shall see in the following section that there are important advantages, from the point of view of simplicity in administration, in placing the burden on the consumers in certain circumstances.

The Institutional Problems

The first institutional problem—that of the availability of funds—will be discussed very briefly. This is not to say that the provision of means for making funds available to utilities at reasonable rates may not be very important. Should we encounter a depression of major proportions, the fear psychology of the

capital market and the temporary financial embarrassment, particularly of the smaller utilities, may make it impossible for them to obtain funds on reasonable terms even though they are perfectly sound investments in the long run. Thus it might be impossible to finance any expansion of facilities which the utilities might wish to make. In such circumstances, government action to fill the need would certainly seem to be warranted. I will not consider the various forms which such action might take in this paper, for to do so would involve a detailed analysis of the utility capital market.

Turning to the second institutional problem—the regulatory one—we find a much more complex situation. The utility industries in this country are regulated with respect to certain of their policy decisions by at least four federal commissions—the F.P.C., F.C.C., I.C.C., and S.E.C., not to mention the Bureau of Internal Revenue and a multiplicity of other agencies and departments—and also by their respective state regulatory bodies. The statutes under which these various regulatory bodies—state and federal—function, differ widely with respect to the degree of control over the decisions of the utilities which is granted, and, most unfortunately, there is considerable overlapping of jurisdictional powers.

In view of these institutional facts, there would seem to be three possible approaches to the goal of stabilization of public utility investment:

1. Public ownership of the utilities. There is of course serious question as to the political feasibility of this solution within the foreseeable future. Moreover, if it were to take place, it would almost certainly be at the local and state or regional level rather than at the national level, so that the problem of imbuing the local officials with a concern for the welfare of the whole economy and for the effects of their decisions on that welfare would re-

¹² In order to avoid any misunderstanding I would emphasize that I do not suggest that public utility investment be geared contra-cyclically so as to offset fluctuations in other types of investment, but simply that it be stabilized over the cycle so that it will not aggravate the cyclical problem.

main. And even if public ownership were at the national level, there is some question whether adequate integration of the policies of the various branches of government could be achieved—whether those responsible for construction of power facilities could or would be induced to consider the effects of their decisions on the cyclical behaviour of the system.¹³

2. The granting of power to the existing regulatory bodies to control the timing of the investment of public utilities. If such control could be positive rather than merely negative it might be adequate to our purpose, but positive regulation of investment in our constitutional context seems impossible. It is difficult to see how the utilities could be forced to invest when they do not want to, without violating due process, particularly if they are to continue to obtain their funds from the private capital market. And once again there is the question: will it be politically possible within the foreseeable future to put such legislation on the statute books? And even if the statutes were on the books, would, or indeed could, the regulatory bodies be equipped with personnel and funds necessary to exercise such positive control over investment.

3. An attempt to devise methods of inducing the utilities to stabilize their investment within the present legal-institutional environment, or at least without making major changes in that environment.

It is the third approach which will be developed in the remainder of this paper, not because the writer prefers it on economic grounds but because of the seeming non-feasibility of the other two on political and institutional grounds. This is not to imply that the third approach involves no political or institutional problems. Indeed many readers will probably feel that the solutions suggested below are either hopelessly inadequate or naive and impractical, and they

may be correct. If so, it is my hope that others will be stimulated to present more practical and effective proposals.

"Excess Capacity" and the Rate Base—A Simple Stimulus to Stabilization

Central to the present institutional pattern, in so far as it concerns our problem, is the rule that regulation must not prevent the utilities from earning a fair return on a fair value, the current meaning of value apparently being either original cost in "public service" properly depreciated, or some compromise between this and reproduction cost such that the utility will be able to "operate successfully, to maintain its financial integrity, to attract capital, and to compensate its investors for the risks assumed . . ."¹⁴ Regulatory bodies and the courts have occasionally made specific exceptions to this rule but these have not been related to the problems created by the business cycle. Indeed, the regulatory bodies have for the most part neglected consideration of the impact of their decisions on the operations of the economy as a whole, either because they felt unable to do otherwise in view of the narrow powers granted to them, or because of apathy or ignorance. In *Economic Standards of Government Price Control*,¹⁵ Donald Wallace and his associates criticised certain regulatory bodies and the courts for their failure to consider the cyclical problem in their rate decisions. We will be more concerned with their limited control over investment than their rate-control powers, and will discuss below in some detail the problems which are involved from the regulatory point of view.

In general, the fair value used for purposes of rate determination is that of used and useful equipment, not of unnecessary and unused equipment (though again

¹³ It has been asserted (in a letter to the author) that the government record with respect to power development in the Pacific Northwest leaves something to be desired in this regard.

¹⁴ *Federal Power Commission v. Hope Natural Gas Co.*, 320 U.S. 591, 605 (1944). See however, Mr. Justice Jackson's vigorous dissent in this case.

¹⁵ Temporary National Economic Committee, Monograph No. 32, *Economic Standards of Government Price Control* (Washington: 1941), Part I *Passim*; Part IV, Ch. IX.

there have been some rare exceptions). This would presumably mean that the currently-unnecessary plant and equipment which would be installed as a result of the policy of long-range planning suggested above could not be included in the rate base.¹⁶ Moreover, even where its inclusion was legally permissible, there is some question as to whether it would be reasonable to require current utility customers to pay the higher rates which this would "justify" in order to meet depreciation and interest charges on the capacity which is being constructed for future use. Indeed, it is generally recognized that, if it is at all possible, rates should be lowered, not increased, in periods of cyclical depression. However, two facts should be emphasized:

1. The depreciation charge on the new plant and equipment need not be at the same rate as that on the remainder of the plant. In many cases it would be reasonable to omit it altogether during the idle period or to make only a token charge. This suggestion is probably at variance not only with regulatory thinking on depreciation but also with operating practices of most utilities, but this is hardly a valid objection to an otherwise sound policy.

2. The addition to the rate base would be small compared to the base itself.

In short, the inclusion of the capital and depreciation costs of the new equipment would not, in most instances, justify a rate increase. In those marginal cases where a rate increase was justified, one would have to compare the stimulating effect on the economy arising out of the investment with the depressive effect of the slight rate increase, in order to determine the net effect of the policy. It seems

most unlikely that the depressive effect would ever outweigh the favorable effects.

Moreover, even if the upward pressure on rates were serious, it might be possible to avoid it by a scheme whereby the utilities would accumulate on their books the depreciation and capital costs relative to the new equipment, but would not be permitted to raise rates or even to justify opposition to demand for reduction of rates during the period of cyclical contraction on the basis of these costs. In the subsequent period of prosperity they would be permitted to earn a return in excess of the "fair" return so as to eliminate the accumulated costs plus interest thereon. The plan, even if it were politically feasible, would involve serious administrative problems, e.g., the definition of "cyclical contraction" and the determination of the speed with which the utilities would be allowed to eliminate the accumulated costs. If the business cycle displayed uniformity of timing and amplitude, there would still be some doubt whether the regulatory mechanisms are sufficiently flexible to implement such a plan. The irregularity of the business cycle as we know it probably makes the plan completely impractical unless drastic changes are made in regulatory procedures and in the attitudes of the courts.

However, there seem to be no major administrative problems in the implementation of the simplest policy, i.e., the policy of permitting the inclusion in the rate base of unused capacity so long as it would be required if there were full employment. In order to implement such a policy it would perhaps be necessary for each utility to maintain, and to obtain Commission approval of a construction plan covering the succeeding eight to ten years, based on projections of demand in a full employment economy. The utilities would be encouraged to construct accord-

¹⁶ On the other hand I have been assured by Dr. Emery Troxel that very few decisions give more than passing attention to "used and useful," and it has been pointed out to me by Dr. John Carter that any newly constructed facilities would almost certainly be used in preference to older facilities while the latter could normally be classified as stand-by capacity, etc. Nevertheless it is perhaps significant that most of the regulatory bodies contacted by the writer stressed this matter of unused facilities.

ing to these plans by permitting the inclusion of unused capacity in the rate base and by pointing out the advantages of lower costs of construction, etc. Except for this, no change would need to be made from current practices.

If regulatory and public opinion strongly support this policy of construction of "excess" capacity during depressed periods in line with the long-range plans of the utilities, much could be achieved, and "half a loaf is better than no bread." But it is doubtful that this policy alone would be adequate to solve the problem of stabilizing investment in the utility industries. The utilities are not guaranteed a fair return and, unless there is some further stimulus to stabilization of their investment programs, the risks of long-range planning and advance construction may be too great. On the other hand, stabilization of construction activities would have certain direct advantages to them in terms of lower costs of construction materials and smaller turn-over of construction labor force; but if these advantages are not important enough to offset the risks, and this would very probably be the case in a severe depression, some further stimulus would be necessary.

Supplemental Stimuli to Stabilization and Related Problems

There are several ways in which the stimulus to stabilization of utility investment discussed in the preceding section might be supplemented. None of these seems to be too satisfactory, some from an administrative point of view, some because of their indirect effects. For example, one might permit accelerated depreciation of the equipment for rate-making and/or tax purposes. But if it were permitted for rate-making purposes, the likelihood of (undesirable) rate increases would be greatly increased, and

if it were permitted only for tax purposes it might not be adequate. In any case, ticklish problems regarding when and to what extent accelerated depreciation would be permitted would be continually arising.

Another possibility would be to make government grants to the utilities based on some formula such that the grant would vary with the amount of unused capacity, so long as total capacity did not exceed that which would accord with long range projections of the utility, i.e., the government might pay the costs of the unused equipment by outright subsidy. Or, the government might itself authorize and pay for the construction in accord with industry demand-projections with the understanding that the facilities would be purchased by the utilities at the time when they were needed at cost less depreciation and obsolescence. These solutions have the distinct advantage of distributing the cost of stabilizing over society as a whole instead of concentrating it on the public utility customers; but the problems involved therein are obvious and manifold.

Unfortunately it is probable that anything like approximate stabilization of investment in the utility industries during a major depression will involve the use of these additional stimuli. I have pointed out above some of the administrative problems which would arise if their implementation were attempted. I do not have the technical knowledge to essay a solution of these problems, but it seems probable that careful and detailed study on a technical level would find solutions to some if not all of them. In any case, much more important *today* than these administrative problems is the educational and psychological problem of correcting the thinking and the attitudes of the regulatory bodies and the public on these matters, a correction which

would be necessary for the implementation of even the simplest policy suggested above, let alone the more complex supplemental stimuli.

The Psychological Problem

It is, I assume, obvious that such policies could be effective only if they were understood by and had the energetic and enthusiastic support of the regulatory bodies and of public opinion generally. This is true not only because serious and sustained efforts to surmount or in some way by-pass the administrative problems will be necessary, but also because implementation of the policies would add considerably to the burdens of bodies which are already over-burdened and under-staffed. Moreover, it would place serious responsibilities on their shoulders with respect to the efficient performance of an important sector of the economy. It is only human to attempt to avoid such responsibility when its assumption is likely to result in adverse public opinion.

The results of some correspondence with several of these regulatory bodies, federal and state, are such as to indicate that, with one exception, a rather complete reversal of attitude will be necessary if stabilization policies are to have a chance of success. In a letter sent to three federal (F.C.C., I.C.C., F.P.C.) and four state (New York, Wisconsin, Illinois, California) commissions in December 1947 I said, in part:

"I would be very interested to know whether the ——— Commission takes cognizance of the desirability of stabilizing investment in the industries over which it exerts some regulatory control, and what measures have been taken to the end of achieving some greater stability in investment over the business cycle.

"If you feel that such anti-cyclical measures are impractical or undesirable from any point

of view, a brief explanation of your attitude would be very much appreciated."

As of this date (September 1949) two of the state commissions have failed to respond. The two state commissions which did respond are considered to be among the "most progressive and far-sighted" of the commissions of this country, yet one was *completely* unsympathetic to the possibility of cyclical stabilization. The Chairman of the New York commission wrote in part:

"... whether prices are high or low public utilities must invest and it is a known fact that demands for service are not high in depression periods and low in flush periods. It is improper for a public utility to increase its investment in periods of depression when demand does not warrant investment and to withhold investment in flush periods when demand is great. Perhaps if one were omniscient and could foretell the future, it might be that the law would be amended or utility financiers induced to prognosticate future conditions, but my experience does not indicate that professors of economics are any more able to foretell exactly what is going to happen and to what extent demands for utility services will increase or decline over any considerable number of years.

"As public bodies including the Public Service Commission are authorized to exercise only the powers conferred upon them by the legislature I would be glad to know in what provision of law you think we could find the power to require a company to invest in plant in periods of depression beyond what they need for the moment and then in periods of flux attempt to equalize the situation."

In the other instance of response by a state commission, the Secretary replied for the Wisconsin Commission as follows:

"... The Commission has considered the construction of additional plant facilities during periods of depression in many cases wherein such construction was authorized, to the extent that such construction could be justified in order to restore adequate plant margins and place the utilities in a position to meet any foreseeable emergency which might be imposed upon them. Such author-

izations provided for additional plant to meet foreseeable load growth for a number of years in the future in addition to sufficient plant margin to allow for failure of large units with no interruption in service. The construction of a large amount of additional plant over and above the above requirements was and is considered impracticable for the following reasons:

- "(a) It would place an undue burden on the present utility customers for the possible benefit of future customers. The future customer will vary considerably from the present customers of any utility.
- "(b) It is deemed advisable to extend the use of utility service as much as practicable by means of furnishing such service at low rates.
- "(c) There is no legal machinery set up in this state by which the Commission may require the present utility customers to pay unreasonably high rates in order to provide capacity for a long time in the future.
- "(d) Changes and improvements in technology would in many cases make present-day equipment obsolete before it would be required for utility service.

"It appears to us that the expenditure of large sums of money for the construction of utility plant during depression periods which will not be needed until some following period of high industrial activity and high prices could only be justified on the basis of a "made work" program and generally such a program could best be devoted to projects which would immediately result in public benefit such as improved highways, public buildings, and such construction for national defense as will be least likely to become obsolete within a short period of time. Such a program might well include the stock piling of durable critical materials which history has shown are needed in great quantities in times of emergency."

If this letter means what it says, namely that the commission was willing to authorize (and presumably encourage) "additional plant to meet foreseeable load growth," it would appear to be in complete accord with the thesis of this

paper; but perhaps there is some difference of opinion regarding the meaning of the phrase "foreseeable load growth," for the tone of the letter is such as to suggest that the Commission does not believe a stabilization policy to be practical or even particularly desirable. It seems obvious to the writer, however, that a load growth which will be consistent with the needs of a full employment economy as determined by projections of past growth trends is as *foreseeable* as any future event—to assume otherwise is to assume incurable stagnation—and that construction or facilities to meet those needs could not be considered "made work." There was no intention of suggesting that "a large amount of additional plant over and above the requirements" of foreseeable load growth be constructed. Moreover, by avoiding the concentration of construction in periods of high costs, a lowering of rates over the long run would be permitted. There might be some upward pressure on rates during the contraction phase of the cycle if government subsidy or "postponed depreciation" were not introduced, but against this would have to be set the cyclical advantages of higher employment and income and the long run decline in rates. Nor is it reasonable for any industry—and particularly for the regulated utility industries—to say: "Do not interfere with our formalized procedures or attempt to stabilize our investment; if our investment is unstable, use public work projects to fill in the gap." Every industry should exert its utmost efforts to moderate the instability of its investment program in the interest of the maintenance of a healthy economy and, in areas of industry which are subject to public control, control which is presumably guided principally by considerations of public welfare, stabilization policies should be pressed with the utmost vigor. The use

of a public works program as an anti-cyclical tool is probably both necessary and desirable within certain limits, but a public works program cannot be expected to do the whole job without tremendous waste; rather it should be merely one part of a broad integrated anti-cyclical policy. It may be objected that there will be no long-run decline in rates if much of the facilities are wasted due to technological change. This is true, but the pace of technological change in the past decade or two does not appear to have been so fast as to give this argument any great weight. In any event I do not see why one should assume that public work projects, particularly national defense projects, are any less subject to obsolescence than utility plant—witness the Maginot line.

The federal commissions, as I suppose was to have been expected, took three quite different approaches to the problem. The Federal Communications Commission wrote:

"The Commission has not introduced, nor does it contemplate the introduction of a specific program of the type you mention.

"It has been our experience that a number of factors must be considered in appraising investment in a particular industry, in addition to consideration of anti-cyclical effects. One of the most important is the factor of rapid technological change which characterizes the communications field."

To me it seems clear that the fact of obsolescence is not enough to warrant the virtually complete rejection of a stabilizing policy. It is perhaps significant that in an investigation made by this commission its counsel was very critical of the high investment made by a certain company in 1930 and 1931. Thus, far from encouraging stabilization, the commission encourages a policy of excessive fluctuation in investment, i.e., it insists upon the application of the acceleration principle.

The Interstate Commerce Commission said:

"The Commission is governed by the mandate of the Congress not only as announced in the declaration of policy [which was quoted and made no reference to counter-cyclical policy] but in the various provisions of the Act which we administer.

"We do not perceive it to be the duty of the Commission either to encourage or to discourage investment . . . That is a question to be decided by individual investors."

The narrowness of approach which this letter evidences certainly bodes ill for the success of a stabilizing policy, for it is the utility industry which this commission regulates which showed the greatest absolute and percentagewise fluctuation in the whole field. Perhaps one should not be too hard on the Commission. The fault may lie with Congress in that the law under which the Commission operates is inadequate to permit it to do anything to stabilize investment, or in that the Commission is not given adequate funds; but surely it is not defensible to argue in this day and age that any regulatory body has not the responsibility of doing its utmost to stabilize investment. Moreover, the nature of existing regulatory statutes is in considerable part the result of the recommendations of the regulatory bodies. They cannot change the law at will but there is abundant evidence that, at least in certain circumstances, they have had much influence on those who do have that power.

Finally, we come to the one commission which showed any optimism or any great enthusiasm with respect to the stabilization of utility investment. The Federal Power Commission wrote:

" . . . this Commission does not have the statutory power to plan and enforce the construction of public utility facilities.

"However, the Commission is doing its utmost indirectly to contribute to business stability.

For instance, in 1939 this Commission published a comprehensive study in which it pointed out that although plant capacity was in excess of the needs of the time, an emergency condition, such as the war, would find capacity to be inadequate. There is evidence to show that this study, together with the Commission's follow-up in specific cases, resulted in adding considerable capacity.

"It is likewise believed that the Commission's rate-making policies encourage utilities in the planning of plant additions. Where an investment is reasonably made for future service, even though the facilities are not used at full capacity, the Commission allows the entire investment therein in the rate base.

"Of course the unprecedented demands which exist at the present time have presented grave problems relating to service. Largely because of the restrictions on plant extensions during the war, we are now faced with actual and threatened shortages which must receive immediate consideration. This is one of the difficulties encountered in trying to balance the business cycle, for in times of high industrial activity, particularly following wars, the needs for service are such that there is no recourse but to do the utmost to install additional facilities as soon as they can be obtained.

"The Commission subscribes to the principle of anti-cyclical planning but at the same time is cognizant of the great practical difficulties which must be overcome in order to make the measures effective."

Inflation and the Stabilization of Utility Investment

Before concluding, I wish to discuss briefly the postwar inflationary situation and the relevance of the stabilizing policies which have been suggested in this paper to such a period.

The regulatory commissions appear to be unanimous in their belief that measures to limit investment in periods when, because of restrictions on construction in the immediate past, a large backlog of needed investment has built up, are im-

practical. In most instances this belief may be justified, particularly where the increased capacity is necessary in order to permit growth in other essential sectors of the economy's productive apparatus; but it is not reasonable to say that because an industry is regulated it should not be restricted. To take a specific example, there is some question whether the very high rate of investment by the telephone industry, insofar as it related to the extension of residential service, was justified from the broad social point of view. Certainly the demand is very insistent—both the companies and the regulatory commission would not receive the approval of the majority of Americans if they slowed down (and thereby spread out somewhat) the increase in residential telephone capacity. But this does not alter the fact that the present policy will make the inevitable process of adjustment, which will be necessary when the current backlog is worked off, much more difficult than would a policy of more gradual reduction of the backlog. I do not suggest that it is possible to shift immediately to the more desirable procedure. It would be possible only if the consuming public were educated to the realities of the situation. One economist has recently written a book, the central theme of which is that even in a planned economy the disturbances in the economic system which arise as a result of these backlogs of demand (or of sudden shifts in demand or changes in technology) could not be avoided because of the short-sightedness of the typical consumer.¹⁷ It is probably true that democratic planning must recognize the impatience of the consumer-voter,¹⁸ but it is possible to adopt aggressive policies designed to change

¹⁷ David McC. Wright, *The Economics of Disturbance* (New York: 1947), *passim*.

¹⁸ This is not to say—as Wright appears at times to say (See *ibid.*, p. 86)—that democratic planning could not significantly reduce the instability of employment and income in a private enterprise economy.

consumer attitudes instead of merely accepting the present situation on the assumption that it is irremedial. What has been needed in the past two years is a restriction of unnecessary investment in order to relieve the inflationary pressure on prices.

Summary

1. The investment by utilities is a significant portion of total investment. In the last major depression it was less stable than comparable investment in non-regulated industries.

2. While the reason for this excessive instability is not hard to find, the nature of the demand for the product, the existence of public regulation and the very serious effects of the instability on the operation of the economy, all point to the need for remedial action.

3. If demand for the final product could be stabilized much of the instability of investment would be eliminated; manipulation of the cost of credit might also have some slight stabilizing effect; but in view of the improbability of achieving an adequate solution by these means in the near future, it is necessary to take a more direct approach.

4. Much of the instability of investment in the utility field would be eliminated if investment by the utilities were geared to long-range projections of demand on the assumption of full employment rather than to year-to-year fluctuations in demand.

5. As a first step toward achieving this goal, the utilities should be encouraged to gear their investment to long-range projections of demand, and they should be permitted to include in their rate base the value of the new equipment constructed during a period of cyclical contraction even though existing capacity were in excess of current demand. If necessary, they should be permitted to include depreciation on such equipment in their allowable costs.

6. Consideration should be given to the development of supplemental stimuli, e.g., government subsidy, accelerated depreciation, the creation of special credit agencies, etc., which would probably be necessary if any significant degree of stabilization were to be attained by this means during a severe cyclical depression.

7. If the policy of stabilization of utility investment is to be effective, a considerable change in the thinking of the utilities, the regulatory bodies and the public generally will have to be accomplished.

8. In the event of extremely long and severe depressions, it might be desirable to replace utility plant and construction with construction of public works to a limited extent, but it is to be hoped that such extreme fluctuations in national income will no longer be tolerated. They will not take place if a broad anti-cyclical program is implemented; one plank in that program should be the stabilization of investment in the utility industries.

Housing in the Redevelopment of American Cities

By COLEMAN WOODBURY*

HOUSING discussions, formal and informal, often remind me of a bit of dialogue from the third act of Hamlet:

Hamlet: Do you see yonder cloud that's almost in shape of a camel?

Polonius: By the mass, and 'tis like a camel, indeed.

Hamlet: Methinks it is like a weasel.

Polonius: It is backed like a weasel.

Hamlet: Or like a whale?

Polonius: Very like a whale.

Of course, I am not suggesting that anyone in this symposium bears any particular resemblance to Hamlet, let alone to Polonius. Housing, however, does take on many differing shapes in different eyes. Housing thought and action, particularly in the last 15 years or so, have been bedeviled among other things by lack of agreement as to the boundaries as well as to the essentials of the subject. Because of this fact, and because I am talking this morning about a phase of housing that may seem to some of you to be near the outer edges of the subject, may I say at the outset what I think housing is. I hope I need hardly add that my definition is still open to modification and correction and that I am not saying that it is superior to anyone else's. It is, however, my starting point for this paper. Let me quote briefly from a statement written last spring for the sessions of the National Conference on Family Life held here in Washington:¹

"Housing is both a product and a process.

"The product is not only the shell or structure of dwellings but their design and basic, built-in equipment—the amount and allocation of space, the heating, lighting,

sanitary and similar facilities. It is also the layout and equipment of the neighborhood—open space, play space, streets, walks, utilities, nursery and elementary schools, shops and other neighborhood facilities. Neighborhoods, of course, are parts of larger communities—e.g., the city, county, metropolitan area, river basin. Although the growth and development of these larger units takes in much more than housing, the usefulness and quality of housing depend in part on its proper location within them: its relations to transit and transportation, to places of work and recreation, to hospitals and medical centers, to educational and religious institutions, to the open countryside and to specialized urban services, etc. In short, housing is the immediate physical environment, largely man-made, in which families live, grow and decline.

"As a process housing again is more than construction, important as that is. It is also dwelling design, neighborhood layout, materials manufacture and distribution, mortgage finance, city and regional planning, public controls, aids and enterprise through such things as building and housing codes, mortgage insurance, housing and redevelopment authorities. It includes maintenance, repair, remodeling, neighborhood services and neighborhood conservation. It requires technical and social research; fact finding and analyzing; individual, family, business and public policy decisions."

While housing officials and students gradually have been widening their horizons, it has become apparent to them, as it had previously to others, that all is not well with the economy and way of life in our metropolitan regions. Perhaps I should say here what I mean by a metropolitan region. To many people, a metropolis is a very large and diversified

Advancement of Science. It is published here with the permission of the AAAS. The footnotes include some materials put out since this paper was written.

¹ National Conference on Family Life—"Working Paper" on Housing (mimeographed) by Coleman Woodbury, Chairman, Housing Committee, NCFL, pp. 1 and 2.

* Director, Urban Redevelopment Study. With a few minor changes, this article is a paper presented at the session on housing—Symposium D, September 14, 1948—of the Centennial Program of the American Association for the

urban center like New York or London or Paris or Chicago. In more technical usage, the term includes these great conurbations but takes in as well many smaller cities with their suburbs plus unincorporated territory that is fairly well built up and that is tributary, economically and socially, to the central city. The Bureau of the Census has a more precise definition that amounts to about the same thing.² The Bureau recognizes about 140 metropolitan areas—all of which have a central city of at least 50,000 population. In 1940 approximately 50% of the total population of the country lived in these metropolitan areas. With the shifts in population caused by the war, the proportion of the population now in metropolitan regions probably is somewhat higher. Although I include all of these areas recognized by the Census when I speak of metropolitan regions, it is true, by and large, that the problems and difficulties now beginning to receive attention are more common and usually are more acute in the larger areas.

What are these problems and difficulties? First and perhaps most apparent are the sizable and growing blighted areas.³ Usually but not always these are near the central part of the central city of the region. Usually but not always they are predominately old residential areas, which in an advanced stage of obsolescence and deterioration are commonly called slums. Almost always, except in times of acute housing shortage and serious economic depression, they are areas of declining population. Over the

years many of them are lived in by successive waves of nationality and racial groups that, for one reason or another, are near the bottom of the economic ladder. Usually, but not always, they are areas of social disorganization—with high rates of crime, juvenile delinquency, communicable diseases; marked in varying degrees by squalor and ugliness, political and economic exploitation, social discrimination and the inevitable bitterness and resentment.

Undoubtedly you have heard such phrases as "our cities are dying at the center," or "this process of the cities emptying themselves," or "planless and chaotic decentralization." Although they are all over-simplifications, all of these and similar phrases are substantially true.

Next on the list of urban and metropolitan ills is congestion—congestion of people on the land, on playgrounds and other recreational space, on schools and other public facilities; congestion of traffic both of people and goods with all of its costs in wasted time and energy to individuals, business, industry and public services. To be sure, hundreds of millions of dollars have been spent over the last generation or so to alleviate urban congestion. Although we sorely need a comprehensive and objective analysis of these measures and their results, it is safe to say that, by and large, they have been at best minor palliatives. They probably have kept congestion from becoming as bad as it otherwise would; they may have shifted its incidence from some districts to others; they certainly

² Sixteenth Census of the United States, 1940—*Population*, Vol. I, page 11, *Metropolitan Districts*. More recently the term *standard metropolitan area* has been adopted. See press release of the Federal Bureau of the Budget—*Standard Metropolitan Areas*, January 29, 1949.

³ Without much danger of word-chopping or jargon-for-jargon's-sake, blight, blighted areas, as well as other words and phrases in the vocabulary of urban planning and housing, might well be more precisely defined. For example of the present spread of meanings, see E. E. Wood, *Slums and*

Blighted Areas in the United States (Federal Emergency Administration of Public Works, Housing Division, Bull. No. 1, 1936); Mabel L. Walker, *Urban Blight and Slums* (Harvard University Press, 1938); Chicago Plan Commission, *Master Plan of Residential Land Use of Chicago* (1943)—particularly Chapter III; Los Angeles City Planning Commission, *Blight—The Problem, The Remedy* (1948); and Committee on the Hygiene of Housing, American Public Health Association, *An Appraisal Method for Measuring the Quality of Housing—Part I. Nature and Uses of the Method* (1945).

have not removed it from the urban scene, nor, in my opinion, substantially lessened it. It remains an economic waste and a continual, unremitting drag on the energies and resources of nearly all people who have to live in the larger cities and metropolitan areas today.

The third major ill of our metropolitan areas is economic and political segregation. As the conditions that made for blight and congestion began to do their miserable work, a very considerable proportion of the wealthy and the well-to-do and a smaller proportion of the weaker economic classes began to seek quiet, green space, decent conditions in which to bring up children, and surroundings conducive to human dignity and self-respect by moving from the central cities. Contrary to a common impression, we have some evidence that this flight from the city usually is not one big leap but a series of shorter jumps—first within the central city itself, then often to one of the larger suburbs, and often again to a smaller town or, more and more, to unincorporated territory within the metropolitan region.⁴ With and as a result of these moves, the central cities have been losing continually a growing number of their economically stronger citizens—those who might be expected, by reason of their economic position, education, and cultural opportunities, to supply much of the leadership in the political, civic and cultural life of these centers.

Not only has this process of hit-or-miss decentralization deprived the central cities in metropolitan regions of needed potential leadership, it has also led to a splintering of the body urban outside the central cities.⁵ Most of our larger metropol-

itan regions now have dozens of municipalities, usually overlaid to some extent by a number of special purpose districts for water-supply, sewerage disposal, etc. Too often each of the municipalities is more or less at war with some or all of its fellows, as well as with the central city. It seeks to attract certain kinds of residents, or business, or industry. It tries just as hard to keep out others. The result is a growing Balkanization of the metropolitan economy. Very few if any of the citizens of these important regions can see the needs and welfare of the complex, interconnected whole. Many don't seem to care. Usually those who do see, at least darkly, and who do care, feel helpless to do more than talk about their fears and hopes.

This cumulative process of confusion and disintegration in metropolitan areas had led to financial difficulties for local governments, public utilities, school authorities, churches and other institutions, merchants in the older business districts and others. The central city loses tax-paying power while its obligations for public services remain unchanged or actually increase. Investment in community overhead in the forms of utility lines and facilities, streets, parks and playgrounds, schools, churches and other institutions, remains the same or declines very slightly in the older sections, while the demands for new investment for the same purposes in the newer areas of refuge from blight and decay increase from year to year. Because of the unplanned and unthought-out character of the growth, these additional investments are made often in costly form and often

⁴Richard Dewey, "Peripheral Expansion in Milwaukee County," *The American Journal of Sociology*, September 1948, pp. 118-125; Milwaukee County Regional Planning Department, *Residential Development in the Unincorporated Areas of Milwaukee, Wisconsin* (1949).

⁵Victor Jones, *Metropolitan Government* (University of

Chicago Press, 1942); Thomas H. Reed, "Progress in Metropolitan Integration," *Public Administration Review*, Winter 1949, pp. 1-10; "The Disintegration of American Cities," *Tax Policy*, June-July, 1947 (Tax Institute, Inc., N. Y.); *The Boston Contest of 1944—Prize Winning Programs* (The Boston University Press, 1945); Paul Windels, *The Metropolitan Region at the Crossroads* (Regional Plan Bulletin, Regional Plan Association, Inc., N. Y., June 1948).

result in inefficient operating units with resulting high costs.

Merchants and other business men see their customers moving farther and still farther from their old shopping centers.⁶ These business men are worried. First a few, but now an increasing number, are trying to catch up with their departing customers by building branch stores in outlying cities or towns in the regions. But they, too, face the problems of additional overhead and possible underutilization of their existing plant.

Although metropolitan conditions and costs are only one set of factors in the shifting pattern of industrial expansion and relocation, they should not be underestimated. A recent study of the large volume of industrial construction during a two-and-one-half-year period ending in late 1947 shows that 46% of the number of industrial construction contracts of \$100,000 and over went into cities with populations of 50,000 and less. Furthermore, 51% of the dollar volume of these contracts was outside the leading industrial areas as defined by the Census.⁷ In these summary figures are hidden many nice problems for study and interpretation. But for our purposes it seems safe to say that industrial managers and directors apparently are among those who are being influenced partly by the present unsatisfactory conditions and uncertain prospects in the central cities of metropolitan regions.

Finally, all these phases of metropolitan confusion and deterioration have at least one common characteristic: they show no signs of curing themselves. The alleged self-balancing proclivities of some economic markets are very hard to identify here. Certainly, if they work at all, it is over such a long period and so ob-

scurely that no reliance can be placed upon them as a matter of public policy. As a matter of fact, despite our general ignorance about many sectors of our metropolitan economies, we have some evidence for believing that many of these forces of blight and disintegration aggravate each other and that their effects over fairly long periods of time are cumulative.

Of course, I have had to paint this picture with very broad strokes. Even so, it is entirely possible that I have given a substantial proportion of my time in this symposium to matters that many of you consider self-evident. If so, just one comment may be in order: it is just because some of these trends and conditions are more or less matters of common knowledge that so very few social scientists, local officials or civic leaders have any clear view of or firm grasp on the whole complex mass. Here is the real danger. Lulled by familiarity with some of these problems, we may underestimate their total significance and temporize, overlook, or neglect the task of understanding our metropolitan economy and way of life. Until we do this, we will be hopelessly unprepared to take firm and wise steps to redevelop our metropolitan regions into a fitting plant and environment for individual and family living in a democratic society as well as for efficient industry, business, and public services.

To conclude this section of my paper, may I add four short comments:

- (1) The severity of disorganization and deterioration varies considerably among even the larger metropolitan areas. The relative significance of blighted areas, congestion, financial problems, and the other manifestations of the underlying ills also vary materially from region to region. All that I have been able to do here is to describe the basic condition in general

⁶ For Example, Richard J. Seltzer, *Proposals for Downtown Philadelphia* (Urban Land Institute, about 1940); K. Lee Hyder and Howard J. Tobin, *Proposals for Downtown Milwaukee* (Urban Land Institute, 1941).

⁷ *News Letter* (March 1948), Association of State Planning and Development Agencies (Chicago).

terms and to try to identify its major components and characteristics.

- (2) By no means are all forms of urban decentralization bad or unfortunate. Through them some families have bettered their housing and other living conditions. Undoubtedly, many more families will do so in the future. The trouble is *not* that our larger urban areas are decentralizing; it is that this decentralizing and recentralizing process, because it is hit-or-miss, largely planless, and poorly understood, is producing only *some* of its potential gains, but many harmful and often unnecessary by-products.
- (3) From this it follows that the essential nature of urban redevelopment is *not* to reproduce some physical, economic or social pattern that has existed somewhere before. It is to make possible and to assure a rebuilding of the obsolete and blighted areas of our metropolitan regions so that these sections will become parts of a sensible urban pattern fitted intelligently to the needs of the present and of the foreseeable future.
- (4) Although we cannot go into detailed comparisons here, this disease of metropolitan regions is by no means confined to this country. Before and early in the war the British made it the subject of two exhaustive official inquiries, which resulted in the so-called Barlow and Uthwatt reports,⁸ and many unofficial analyses and discussions of varying quality. Today steps being taken under two acts of Parliament, the New Towns Act of 1946 and the Town and Country Planning Act of 1947, are among the most prominent features of the domestic scene. Although these measures are much more drastic than anything that has been seriously proposed here, they command widespread support that is by no means limited to members of the Labour Party. A recent book on Australian cities has as the title of its second section, *The Urban Desert—Shrinkage of Population—Sign of Urban Decay* and reads in part:⁹ . . .

So, for instance, the population of the inner area of Melbourne, comprising the Municipalities of Melbourne, Richmond, Fitzroy and South Melbourne, has decreased from 262,472 to 238,200, about 9 per cent, in the last two decades from 1920 to 1940; while, in the same period, the population of the remaining area showed an increase from 525,742 to 838,500, equalling 60 per cent."⁹

During the late 1930's, the term urban redevelopment came into fairly common use with widely varying meanings and connotations. Even then it became evident that we were going to have plenty of misunderstanding, groping and fumbling before a clear and wise public policy could be evolved. One of the most serious troubles may be shown by analogy. The officials of an industrial corporation find many evidences that their present plant is not operating too efficiently. Its costs are high; its working conditions poor; its product subject to growing consumer criticism. The officials decide that drastic rebuilding or modernizing is in order. They look around among their own staff and outside consultants for ideas, advice and plans. They find many experts with many detailed data on all the various sections and individual operations of the plant. To their chagrin, however, they find relatively little interest and much less real knowledge about the relations of these divisions to each other, the layout of the plant itself, the movement of materials and parts from one operation to another. Finally, they find the least reliable information of all on what the consumers think of the product or what improvements in it they might like to see.

All analogies, of course, have their limitations, but this improbable account of an imaginary venture in industrial planning illustrates, for me at least, the

⁸ Report, Royal Commission on the Distribution of the Industrial Population, Cmd. 6153 (His Majesty's Stationery Office, 1940); Final Report, Expert Committee on Compensation and Betterment, Cmd. 6386 (His Majesty's Stationery Office, 1942). Also pertinent is the so-called Scott report—Report of the Committee on Land Utilization in Rural Areas, Cmd. 6378, (His Majesty's Stationery Office, 1942).

⁹ Ernest Fooks, *X-Ray the City! The Density Diagram: Basis for Urban Planning* (Melbourne: The Ruskin Press, 1946), p. 10.

basic although not the only obstacle that has confronted and still hinders urban redevelopment. Collectively we know quite a lot about many phases of urban life and metropolitan patterns. Very few, if any, persons can see the whole. The gaps in our knowledge and research are too wide. We have trained very few social scientists to look at metropolitan regions as units. Local administrative officials in government, industry and civic undertakings are so tied down to details of operations that most of them miss the forest for the trees. The more thoughtful planning officials and consultants probably come as close as any to having the qualifications and approach that are so sorely needed, but the resources of most of them have been so slight that they simply have not been able to test many of their hypotheses about the metropolitan community—let alone to make firm a substantial body of facts and generalizations and to express it in language that other reasonably intelligent persons could understand.

Because our society has been so poorly prepared for the problems and needs of urban redevelopment, panaceas and too-easy solutions have found a ready audience. This story of partial analysis, preliminary proposals, false hopes, and further study should be told sometime in some detail. That time is not now. Instead, may I note only two landmarks.

First, very early in the consideration of redevelopment and its problems, substantial agreement was reached on the point that in the blighted areas rebuilding would have to be undertaken in fairly sizeable tracts. Lot-by-lot or even

block-by-block operations ordinarily would fail simply because they would be too small. For a reasonable chance of success, a redevelopment project, particularly a residential one, would have to be large enough to stand out against the surrounding blight and squalor, to create a decent, immediate environment for most of its units and their occupants. So the power of eminent domain was given, first to private corporations under public supervision, then to local housing authorities, and still later to other private corporations often under only nominal public oversight. In addition to local housing authority enabling acts, some 24 states have redevelopment laws nearly all of which give eminent domain power to public redevelopment authorities or to private corporations of some kind.¹⁰ It soon became clear that these grants of eminent domain were useful tools but, in and of themselves, would accomplish little. Most of the grants to private corporations, as a matter of fact, have resulted in nothing.

About the same time, land costs in many blighted areas began to draw attention. Soon it was concluded that if some way could be found to write down either the capital cost of acquisition or the annual cost on leases to redevelopers, large-scale rebuilding would get underway. The Wagner-Ellender-Taft and the Taft-Ellender-Wagner housing bills had sections under which federal financial aids would be given to this end for blighted areas that either were predominantly residential or the new use of which would be primarily housing. Although Congress did not pass either of these bills,¹¹ a few states have enacted measures that make possible some kind of reduction of acquisition costs. The progress to date has been slight. Of

¹⁰ Office of the General Counsel, National Housing Agency, *Comparative Digest of the Principal Provisions of State Urban Redevelopment Legislation* (April 1, 1947, mimeographed) and *Supplement to Comparative Digest of the Principal Provisions of State Urban Redevelopment Legislation* (Division of Law, Office of the Administrator, Housing and Home Finance Agency, May 15, 1948).

¹¹ The Housing Act of 1949, approved July 15, 1949, does make available these federal aids to local public agencies properly empowered and established.

course, postwar conditions of material shortages, high construction costs, and housing shortage have created formidable obstacles.

First-round experience with these measures, however, justifies two conclusions. First, no single attack or single legislative or financial tool will do the job single-handed. Second, this piecemeal, experimental approach, although not without its merits, has the serious drawback of focusing attention on a very few projects at the cost of losing perspective on the whole—the job of urban redevelopment that needs to be done.¹²

In this paper I have tried to emphasize a few basic facts about urban redevelopment. Our metropolitan regions are enormously important in our economic, political, and social scene—present and prospective. Nearly all of these regions, particularly the larger ones, are afflicted with a deep-seated disease. The major symptoms of this malady are blighted areas, congestion, political and economic segregation, and financial troubles of many kinds. The disease seems to be spreading as these manifestations of it re-enforce and strengthen each other. Urban redevelopment measures so far have been inadequate, piecemeal attacks on one of the symptoms—the built-up blighted areas.

In concluding, may I simply list a number of statements about the present and future of urban redevelopment that seem to me to deserve your consideration. I realize that this is a risky undertaking. I haven't time to explain or qualify these statements. Some of them *suggest* hypotheses to be tested by further research. Some are recommendations on public policy. Others are tentative conclusions

from our scattered experience to date. Many are hybrids of these forms of propositions. In behalf of them, however, I can say two things. Most of them would command some degree of assent among those who have given the most study to the problem. All of them, I hope, deserve consideration and discussion by you and others interested in decent urban housing and efficient, healthful metropolitan regions. Here they are:

1. Blighted areas are of two major kinds: the old, usually built-up district and the dead or dying subdivision area. Both require fairly drastic treatment. Usually they should be attacked together as parts of a coordinated program.
2. Blight clearly is of differing degrees of intensity. Often acquisition, clearance, and new layout of land are necessary. Sometimes, if the blighting process can be caught in its early stages, less radical and less expensive treatment will suffice. These measures, which aim at restoring and protecting basically good residential qualities, have been called neighborhood rehabilitation and conservation.
3. Where land acquisition, clearance and re-layout are required, public agencies have decided advantages over private corporations. In the built-up, blighted areas, some form of write-down of acquisition costs is usually necessary. Federal, state and local participation are desirable here. Also, eminent domain procedure in most jurisdictions needs revision in the interests of speed, economy, and fair awards.
4. Land acquisition, sale and lease for redevelopment ought to be one part of a consistent, local land policy. The other parts include land acquisition and sale for other purposes, zoning ordinances, subdivision control, handling of tax delinquent parcels, police power measures for demolishing or closing unfit structures and regulating new buildings, special assessments, and public housing.
5. Both considerations of optimum urban living conditions and military security in an age of atomic and bacteriological warfare, indicate that some considerable

¹² An attempt at outlining the range and character of the redevelopment needed by many American cities and metropolitan areas is, *Rethinking Urban Redevelopment*, by Coleman Woodbury and Frederick A. Gutheim, (Chicago: Public Administration Service, 1949).

part of the present blighted areas ought to be left vacant for park and playground space and for such uses as parking.

6. Urban redevelopment requires at least some simplification and rationalization of local government organization in metropolitan areas. One of the first objectives of this reorganization should be to make land-use planning effective throughout the whole metropolitan region.
7. Effective land-use planning in metropolitan regions requires, among other things, much more knowledge and understanding than we now have on the relative economy of different land-use patterns and densities and on the characteristics of present and prospective shifts in industrial location. Among land-use patterns, the satellite-town form of metropolitan organization, so much favored by the British, deserves very careful study.
8. Public housing, or some other means of providing really acceptable low-income housing, is a prerequisite of land acquisition and clearance, except where a blighted area might be almost entirely industrial or commercial. It is also clear that in most localities low-income housing will be the proper reuse of substantial areas of the present blighted districts. In most localities to date, we have no other means than public housing for assuring good quality housing for most families of low income.
9. Because urban centers should be much more than efficient plants or machines, as well as for other reasons, urban redevelopment should be the subject of widespread, continuous citizen education and participation.
10. For the same reason, current proposals for the neighborhood as the unit for residential redevelopment deserve thoughtful analysis and study. Admittedly most

of these proposals are incomplete and often fuzzy. Admittedly the neighborhood unit can be perverted into a device for racial or social discrimination. The fact remains that good urban housing is more than sanitary shelter and good urban living is more than the absence of noise, dirt and congestion.

11. The prevailing systems of local taxation, including assessment, often are obstacles to comprehensive urban redevelopment. In the long overdue revision of local revenue resources, the needs of urban redevelopment should have a prominent voice.

Just one more observation: urban redevelopment cannot be a simple operation or program. It cuts across too much of our complex urban structure and society. It is probably also true that any attempt to treat it in half an hour makes it seem even more difficult than it really is. But we are not starting from scratch. We have many facts, much rather segmented understanding, some preliminary experience, much good-will and vision among public officials, students of urban affairs, and local community leaders. And much is at stake. During the next generation or so, we have a great opportunity to make our cities not only fair symbols of our vigorous, productive economy, but also of our democratic ideals and possibilities. No lesser objective, it seems to me, is worthy of the collective efforts of our nation; no meaner goal will make possible the kind of urban housing and living that the American people want and deserve.

Railroad Rate Levels and Earning Power in an Era of Competitive Transport

By ERNEST W. WILLIAMS, JR.*

SINCE the termination of the war the railroads of the United States have sought and secured general increases in the level of their rates in three successive major proceedings before the Interstate Commerce Commission. As a result of the decisions in these cases rail rates have advanced to a level approximately 57 percent above those prevailing in 1939. Increases in the East have been most severe and these approximate 62 percent of the 1939 level.¹ Such increases not only raise serious problems for the consumers of transportation, but also constitute perhaps as much a threat as a solution to the revenue problems of the carriers.

The analysis of this situation which follows was originally prepared in December 1948, and presented as a paper before an informal group of transportation and utility economists at the meetings of the American Economic Association. In its essential points it has been strengthened by the passage of time and the trends noted have, for the most part, grown rather than diminished. On the one hand, the financial problem of the carriers has been aggravated by the beginning on September 1, 1949, of the 40-hour week for non-operating employees and the accompanying wage increase. On the other hand, diversion of traffic to other forms of transportation has become more rapid and the efforts of shippers to minimize transportation costs have become more marked.

In successive revenue cases the stand taken by shippers, epitomized in the attitude of the National Industrial Traffic League, has become progressively stronger and has changed from concern primarily with rate relationships to concern about the rate level as well. As recently stated by the League:

"On the one hand, league policy has been and is that the railroads and other transportation agencies should be well nourished and have adequate revenue not only for meeting operating expenses, but to yield a fair rate of return on investment. On the other hand, continuing rate increases cannot be the answer to the revenue needs of the carriers, not only because of the economic effect on the country but especially because so much of the increased revenue expected to be realized from increased rates is lost because of traffic changes or diversions, or payments of increased taxes . . . Out of every dollar of anticipated increased revenue the railroads will probably realize only fifty cents."²

Financial Position

The financial position of the railroads, which improved considerably during the war left the carriers in an apparently strong position at its end, but has deteriorated considerably since. From 1939 to 1947 funded debt declined from \$10.7 billion to \$8.4 billion.³ Decline has continued but at a much slower rate, while long-term obligations represented by equipment trusts have increased substantially. Meanwhile investment in road and equipment after accrued depreciation has declined from \$23.1 billion in 1939 to \$22.9 billion in 1947, though depreciated investment per mile of line has

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¹ Interstate Commerce Commission, *Monthly Comment*, September 13, 1948, p. 11.

² Quoted in 125 *Railway Age* 1032 (November 27, 1948).

³ Interstate Commerce Commission, *Statistics of Railways of Class I*, Statistical Summary No. 32, October 1948.

actually increased somewhat consequent upon abandonments during the period. The relationship of funded debt to total capitalization and to depreciated investment is clearly superior now to that in the prewar year. Fixed charges, moreover, have shown an even more striking decline from \$608 million in 1939 to \$437 million in 1947.⁴

The favorable appearance created by this showing is considerably dulled when the behavior of earnings is considered. In 1947 operating revenues were 2.2 times their 1939 level, operating expenses 2.3 and tax accruals 2.8. But with these levels net operating revenue was but 1.8 times the 1939 figure. Only 1.3 times the 1939 figure was carried through to net railway operating income. Had operating expenses borne the same relation as revenues to the 1939 performance, \$378 million additional might have been carried into net operating revenue. Had tax accruals borne the same relationship another \$155 million would have been added to net operating income. Although 50 percent above 1939, the net railway operating income of 1947 was little more than half the peak 1942 figure. Return on depreciated investment which stood at 2.55 percent in 1939, reached 6.30 percent in 1942, touched a postwar low of 2.75 percent in 1946, and increased moderately to 3.41 percent in 1947. For the first nine months of 1948 considerable improvement was shown, consequent chiefly upon the rate increases granted in *Ex Parte* 166, but also upon technical improvement and better expense control on certain of the carriers. For the United States as a whole, Class I steam railroads enjoyed income 32.7 percent above the like period of 1947, although traffic was somewhat off.⁵ The full year figures will be somewhat less

favorable because of continuing declines in traffic volume, wage awards, and further increases in the prices of materials and supplies. But income at the 1947 level represents a coverage of fixed charges of about 1.8.

Unfortunately, the distribution of net income among the major lines is extremely uneven. In the twelve months ended September 1948, the New York Central was able to carry through but 3.7 percent of its revenues to net railway operating income, the Pennsylvania but 7.4 percent, the Atlantic Coast Line 6.9, the Milwaukee 8.5, the North Western 7.6.⁶ Virtually every large eastern road and most southern roads had a net income which represented a lesser percentage of its revenues than in the equivalent 1940 period. Western lines, on the other hand, showed striking improvement in a number of instances, notably those of the Santa Fe, Union Pacific, Missouri Pacific, Burlington, Rio Grande and Rock Island. The northern transcontinentals displayed weakness as compared with principal central and southwestern lines. A not inconsiderable element of the emergency claimed by the railroads stems from this lack of consistency in performance among the territorial groups of carriers and, to a lesser degree, among carriers within the groups. In a general way the territorial differences are reflected by the several rates of return which in a very rough way relate earnings to requirements. For the twelve months ended September 1948, the rates were: Eastern District (including Pocahontas) 3.93 percent, Southern District 4.50 percent, Western District 4.44 percent.⁷ Were the Pocahontas roads excluded, the Eastern District performance would appear even less satisfactory.

⁴ *Ibid.*, pp. 1-2.

⁵ Interstate Commerce Commission, *Monthly Comment*, November 10, 1948, p. 15.

⁶ *Ibid.*, pp. 1-3.

⁷ Association of American Railroads, *Railway Revenues and Expenses*, September 1948.

The present crisis portrayed by the railroads stems not so much from conditions revealed by published statistics to date, as from recent and anticipated wage awards and continuing price increases. Carriers' working capital is at present being rapidly depleted and estimates based upon present rate levels forecast a dismal showing for 1949. The railroads in their exhibits for *Ex Parte* 168 expect, on a slightly diminished volume of traffic, a return of but 2.9 percent for 1949 under the present rate level assuming that the wage increases to non-operating employees follow the 10-percent pattern established for the operating groups. Should present relationships among the districts hold, the return in the Eastern District would be but 1.2 percent. I do not here attach any particular significance to rate of return as such, nor do I suggest a norm, but use it simply as a ready basis of comparison. At the end of the war carriers had what appeared to represent adequate working capital—\$971 million cash and \$595 million materials and supplies. Both figures were some 85 percent above 1939, but neither had increased as rapidly as traffic and revenues. Though high traffic levels have persisted since, net working capital has been dissipated at the average rate of \$27 million a month. From \$1,569 million at December 31, 1945, the figure fell off to \$868 million at December 31, 1947, and to \$789 million at August 31, 1948.⁸

Significance of Financial Position

Even without a rate increase, carriers' estimates do not suggest financial failure of any large group of carriers in the near future. Some few may stand in danger, primarily certain lines which barely scraped through the thirties without reorganization and which have achieved

only modest debt reduction. The short-term danger of significance to the country is not one of financial collapse in the usual sense, but one of arrested technical progress, deterioration of plant and continuing inability to meet the service demands of business as now conducted. Service deficiencies are acute today, capacity is not wholly adequate and much more still remains to be done on some important lines to restore even prewar physical standards. The railroads stand in a period of trial during which the general course of their future will be determined largely by the way in which they meet current problems. The stage may be set for continuing and permanent decline which will compel further marked shrinkage in plant and, at some point, may confront the nation once again with difficult decisions associated with solving a railroad "problem."

The situation which carriers are seeking to remedy by a further increase in the rate level is one of inability to finance and carry forward to completion their comparatively modest programs of physical and service rehabilitation and improvement. It is well understood that capital improvements cannot now be financed by security issues. Moreover, equipment trust money is becoming more expensive. The bulk of the improvement must be accomplished by reinvestment of earnings—the same method by which carriers have been financing most of their requirements since before World War I. Such a reestablishment of credit as would permit equity financing of even a portion of the necessary improvements appears utterly out of question.

Throughout most of railroad history the necessity of quantitative and qualitative increase in plant and equipment has stemmed largely from the physical demands of growing traffic. Car shortages of large magnitude and acute congestion

⁸ *Traffic World*, December 4, 1948.

of facilities during peak periods made the needs for more equipment, motive power, yard capacity and main trackage only too obvious. Since competition was limited to that offered by water lines and was, in general, well controlled after 1875, service standards and competitive costs were of limited significance. Conditions began to change in the twenties when sheer physical shortages had been largely overcome, but the competitive possibilities of new forms of transport were beginning to be apparent and changes in business methods were necessitating closer conformance to the needs of shippers for quality in service. In those years the foundation for the wartime performance of the railroads was laid by qualitative improvement.

The recent war caused a severe drain upon the entire physical plant of the railroads. Although care was taken to make available as much maintenance material as possible, it was never possible to supply rail in the quantities needed and the condition of equipment of every class suffered from accelerated use and minimized maintenance. Some roads did benefit by securing considerable quantities of diesel power, others by effecting improvements to permanent way and signalling where these were considered vital to war traffic. But, in general, the heavy war traffic left the roads in weakened physical condition. Plant is far from satisfactory today. Service is inferior to prewar standards in the movement of most of the freight traffic, car shortages have been serious and car production is slow. Meanwhile motor transport is growing rapidly, the very high rate of truck production contributing considerably to this end.⁹ Even though motor carriers still carry a relatively small proportion of the nation's freight traffic, their gross freight revenues

are estimated to exceed 35 percent of railroad gross freight revenues, indicating that they have achieved marked success in diverting the high-rated, profitable traffic.¹⁰ Under these circumstances the railroads face a fight for position which must be made by competing vigorously both in price and service. Otherwise it cannot succeed. All this requires significant physical improvement which at present prices would cost an enormous sum.

Importance of Maintaining Earning Power

The railroads still account for over 62 percent of the ton miles produced by all types of transportation in the United States. They continue to fill an important role in the passenger service as well. They are and will remain for the foreseeable future the indispensable heart of our bulk transportation system. It is a matter of grave concern that deficiencies have not been made up more rapidly, that capacity continues to be pressed and that there is little if any cushion to meet emergency demands.

In the normal course the United States cannot afford to be deprived of the advantages to be secured from continuing technical development. The railroad is by no means mature or stagnant in its technology. No other form of land transportation can match its advantage in the mass production of ton miles by assembling tonnage in large units for over-the-road movement. The developments of the last two decades have opened up new possibilities and have been, in this respect, perhaps the most fruitful decades in railroad history. The rapid transformation of motive power; the improvements in the design of cars, track, signalling and freight-handling facilities, and the development of mechanized track work all

⁹ Over 1,200,000 new trucks were produced during 1948 and registrations advanced sharply.

¹⁰ Address of Walter W. Belson, American Trucking Associations, Inc., before Advertising Club of Los Angeles, November 10, 1948.

promise further economy even as service standards are enhanced. There is inherent in such improvement the only answer, if there is one, to the economic dilemma which the carriers face. Technical means are available which can give us a new conception of economy and preserve against all competitors the standing of the railroads as the cheapest method of haulage for most of our freight wherever naturally navigable waterways are not available. Unfortunately, application of known means lags, largely because of uncertain economic outlook and, in the case of some of the roads, actual financial stringency. Should financial obstacles be removed the inherent conservatism of a large element of railway management might well stand in the way.

To the student of railroad physical plant and operations the failure to utilize more effectively and universally the ever-increasing means to more efficient operation is both astonishing and disheartening. The great variety of better methods employed in one or another instance over the system is hardly ever brought together in forceful combination on any single road. What is notably successful in any one situation is only slowly if ever applied to many similar situations elsewhere. Even successful performance on a section of a single road appears to achieve limited transference to other parts of the same system. Few of the available means are pushed to anything approaching the margin of profitable application.

A good railroad physical plant attuned to the needs of the area it serves can make money and provide the revenue needed to keep it abreast of developments. This principle can be seen at work in such instances as the Santa Fe, Union Pacific, Norfolk and Western and, under relatively unpromising conditions, in the rapid rehabilitation and development of

the Monon under its present management and in the growth and reconstruction of the Gulf, Mobile and Ohio System. An active and progressive management can do much to make the most of comparatively limited opportunity and, experience suggests, effect sufficient reduction in expenses and restoration of competitive position to carry forward *pari passu* with further physical improvement once funds are found with which to make a good basic start upon a plan which places the necessary steps in an appropriate order of priority.

The railroad industry must go forward, or stagnate and decline. It cannot, in a competitive era, continue the equipment, methods and standards of the past. Its competitors are going forward and as the railroad loses to them it tends to lose more or less permanently. Shrinking traffic will compound its problems and in time confront the nation with the necessity to find public means to save the situation. For other types of transportation can undertake economically only certain portions of the job which the railroad has performed and nothing points to their development of ability to handle the greater part of that job. The danger is, however, that so much high-class traffic will be permanently lost by the selective choice of competitors that the ability of the railroad to do its indispensable basic job will be impaired.

Present Destructive Tendencies

In considering general rate-level increases as a possible solution for the financial problems which the railroads face, appropriate attention must be given to the effects of such increases upon both the volume and composition of traffic. Such consideration, moreover, must include the long-term as well as the short-term effects. Unfortunately, little is known in a quantitative way about the

elasticity of demand for the railroad freight service. Since it is a derived demand its analysis is fraught with the utmost difficulty. Certain it is, however, that elasticity is considerable over a wide range of traffic since effective and widespread competition has developed.

The increases thus far applied are providing prolific demonstration of the susceptibility of freight traffic to diversion. The range of commodities for which the motor carrier can compete has clearly increased as the rail rate level has risen. Diversion is becoming possible, moreover, for hauls of greater distance. Transcontinental truck traffic is becoming common, and high-class items are moving in large volume over distances of 2000 miles and more. The traffic in certain commodities has been almost wholly lost to the railroads. And the list includes not only such valuable items as whiskey and tobacco products (and even a good deal of leaf tobacco on fairly long hauls), but also some bulk items which formerly moved in fully loaded cars of large capacity, e.g., dairy products, iron and steel, clay and products, and aluminum. As to this last commodity the producing industry testified in *Ex Parte* 166 that it could stand no increases in rates and that, whereas under the then existing adjustment aluminum could be shipped more cheaply by private trucks for distances up to 580 miles, it would be necessary to use trucks for hauls up to 700 miles.¹¹ Much of the traffic has since been diverted, though a much lower level of rates unquestionably would be profitable to the carriers. Numerous other examples might be cited, including the long-distance movement of a wide variety of agricultural products such as fruits, vegetables and livestock.¹² Since the service advantage of the truck is often

marked, the difficulty of holding traffic to the rails is considerably enhanced. And since a large part of the growth in trucking is in private vehicles, diversion is likely to be relatively permanent once it has begun. It should be emphasized again that much of this traffic undoubtedly would be profitable to the railroads at competitive rates, and this is becoming more true as significant quantities of carload business are diverted.

To economize in transportation by reducing the length of hauls, or by eliminating some hauls altogether, is a slow process ordinarily since it involves plant relocation and changes in production and marketing practices. For the same reason it tends to be a more permanent adjustment than the mere shift of business from one type of carrier to another. There is some evidence to suggest that movements of this sort have been in progress at least since the large general rate increases which followed World War I, although those increases, like the recent ones, were not proportional to the advance in the general price level. Following 1921 there has been a steady decrease in rail operating revenues per dollar of national income. The drop from 10.39 cents in 1921 to only 8.08 cents in 1925 is certainly suggestive of the potency of rate increases to affect the volume of railroad business, as was widely testified at the time. Competitive diversion was still limited and the shifts in the nature of economic activity belong largely to the later twenties. Unquestionably, there was in those later years a tendency for economic growth to focus upon activity which is less productive of freight tonnage. And after 1925 the relationship of revenues to national income becomes obscured by the diversion factor. That the railroads fared

¹¹ *Traffic World*, 804, 872, 1419, 1650-51, 1819-20, 1909, (1947).

¹² See, for example, the suggestive article in *Railway Age*, October 23, 1948, pp. 772-774.

somewhat better in the early depression years in the behavior of this particular index appears to be largely the result of the larger importance of basic bulk items in the economy in those years of low traffic levels. Recovery was followed with further sharp declines and neither war nor postwar conditions have altered the downward trend. By 1946 railroad revenues were but 4.3 cents per dollar of national income.¹³

It is difficult to secure a statistical clue to economic readjustments designed to reduce the demand for transportation. Too many other factors are at work. But there is a great deal of suggestive evidence in the way of reports of locational changes in particular industries, changes in market practices, dispersion of certain industrial processes, and emphasis on nearness to market in the location of new industrial enterprises and plant expansion.¹⁴ The desirability of plant location adjacent to inland water transportation also is being stressed and the extent to which location off railroad lines is being practiced indicates intent to rely more and more upon motor vehicle transportation. The shift of industrial growth to the west and south is a partial indication of the greater importance attached to nearness to markets and of growing decentralization as well. It marks the beginning of the end of some of that constructive long-distance cross hauling which was so productive of rail traffic. It means shorter average hauls and greater vulnerability to motor transport. In addition it serves to accentuate the plight of the eastern roads whose traffic has been falling while other districts gained and whose problems of operating expense control are greatest.

The qualitative changes which are taking place in rail freight traffic are

partially disclosed by a comparison of traffic composition in 1947 with that in 1946. Originated tonnage increased some 13 percent, but less-carload traffic actually declined, as did the tonnage of animals and products. The movement of manufactures and miscellaneous increased only 10 percent, indicating failure of the railroads to hold their own in this relatively high-class tonnage. The movement of products of agriculture increased considerably less than proportionately. The increase in total traffic was overwhelmingly accounted for by the low-rated items. There is strong reason to suppose that these tendencies have exerted themselves even more vigorously in the present year. In the same period the average haul fell off further, as might be expected from an increase in the proportion of low-grade traffic. Moreover, the railroads failed to secure as large increases in ton-mileage as did other forms of traffic, for their increase was but 10.4 percent while truck traffic grew 21.2 percent, inland waterway traffic 19.7 percent, pipe line traffic 12.5 percent and air traffic 35.1 percent.¹⁵

No consideration of the nature of the present problems of maintaining rail revenues is complete without reference to the passenger deficit. Exceptionally high load factors which accompanied the huge wartime increase in passenger traffic enabled this phase of the business to contribute heavily to net operating revenues during the war years. But as the traffic fell off, rapidly mounting deficits were encountered, now exceeding the rate of \$200 million annually. This is a heavy burden upon the carriers and it exists despite the fact that the great majority of the modern long-distance pas-

¹³ Thus closing and shifting of clay products plants were testified to in *Ex Parte* 166. See, *Traffic World* 1647 (1947). Similarly on cement, *Traffic World* 1909; gypsum products, *Traffic World*, 1421; canned goods, *Traffic World* 1571.

¹⁴ Interstate Commerce Commission, *Monthly Comment*, November 10, 1948, p. 9.

¹⁵ Interstate Commerce Commission, *Monthly Comment*, November 10, 1948, p. 12.

senger trains are profitable. Rail passenger traffic volume declined more than 10 percent during the past year and the decline continues. As volume declines the maintenance of adequate load factors becomes more and more difficult, for train mileage is not shrinking in the same proportion.

Where the Solution Lies

No permanent solution for the railroads' continuing problem of physical obsolescence and revenue deficiencies can be found in merely continuing increases in the general rate level. Instead, many steps representing a complicated whole must be taken. While the success of the program outlined below is by no means certain, I believe it represents a more constructive approach than does primary emphasis upon rate level.

Of first importance is substantial reconstruction and re-equipment of the railroad system for the twin purpose of enabling it to meet competitors' service standards and to effect substantial operating economy. Capital needs for this purpose are heavy, lying between \$1.5 and \$2 billions per annum, or considerably above the rate achieved by the roads in the postwar years to date. A good deal of this must be placed in permanent way and structures—reducing curvature and grades, stabilizing track for reasons of cheaper maintenance, rebuilding strategic yards and accompanying facilities, and effecting large improvements in stations and freight-handling facilities. The terminal problem, so great a source of delay and expense, must be solved in the larger urban centers and points of traffic focus. This may require, in a number of instances, virtually complete rearrangement and reconstruction. And the faster it can be accomplished the better for continued railway health. Representing perhaps one-half of the operating expenses, the terminals should

be a principal point of attention. In fact, they have been substantially neglected and become every year a more serious drain. In equipment, great progress has been made already in the acquisition of new motive power, and this is the most promising single war and postwar development. But freight-carrying equipment needs replacement in large numbers for maintenance economy and reliability and needs closer adaptation to the requirements of shippers.

The country, much less the railroads with present earnings, cannot afford to bring all main-line and terminal facilities to the standards which service and economy require. The work must be concentrated upon the superior main routes and upon those terminal facilities which, supplemented by new construction, can afford the most economical combination. It must, in other words, be a selective improvement. This requires widespread consolidation among the railroads designed to produce strong systems which, by appropriate concentration of their resources upon selected routes, can utilize them the more effectively. Unfortunately little combination is in progress, nor does what is taking place follow a pattern designed to achieve the purpose here envisaged. It is difficult to avoid the conclusion that public attention to orderly consolidation is essential and that it should be a first order of business. In the process much open routing must be sacrificed to the interests of traffic concentration and economy. The carriers, moreover, must tend more and more toward specialization in the mass production of transportation. The less-carload business would no doubt well be turned over to specialists effecting coordinated use of the several types of transport. Abandonment of unprofitable passenger schedules must be pushed and, in view of the alternatives

now usually available, a more cooperative attitude on the part of public bodies is long overdue. The railroads themselves should substitute a more economical means wherever possible for the essentially retail portions of their operations and should be offered encouragement in this task. Consolidation itself will enable the concentration of much traffic over the most economic routes and the lopping off of much light-traffic mileage.

At best this program is a long-term one, but it should be begun at once. Some of the benefits can be secured in short order, just as they are being secured from the more moderate, dispersed efforts of the carriers today. The full benefits will be slowed materially by the necessity to secure a change in labor relationships and modification of working rules, a subject too large to be touched on here. In the meantime, revenues must be preserved as far as possible without producing effects which promise long-term harm. This requires not a general rate level advance as much as highly selective adjustments. Present tendencies indicate clearly the necessity to consider seriously elasticity of demand in making rate changes. Commodities whose movement is relatively immune to competitive diversion must be called upon to bear the greater portion of the increases. This has not been done effectively in the recent rate-level changes. Profitable traffic that is being lost must be attracted back by both rate reductions and service improvement—greater speed, in some instances lower carload minima, greater care in handling, and better adapted equipment. Sight should never be lost, when traffic is threatened with permanent diversion, of the advantages of retaining it even where it cannot make a full contribution to overhead. This is eminently a time for the consideration of alternative costs. And the paralysis enforced by fear of

“breaking down” the rate structure is highly dangerous in the face of the steady loss of the more lucrative traffic handled under that rate structure. Great freedom to experiment should be afforded above the limit set by out-of-pocket costs; and initiative on the part of the carriers should be encouraged. In a fast-moving competitive situation the hobbles represented by suspension for investigation may be sufficient to permit the loss to take place, after which much more severe cuts may be necessary if the traffic is to be regained. Diversion must be combatted in anticipation in preference to waiting for the event.

Pending consolidation, the adjustment of divisions is worth serious study as a means for the better distribution of revenue among the carriers. In the face of changed cost relationships the bases underlying present divisions in many instances must appear anachronistic. If carrier initiative does not develop, the Commission might find it desirable to enter upon appropriate investigations. The carriers would do well, meanwhile, to develop a definite program and a capital budget attuned to it. Their present showing is much too vague and gives little evidence that they have fully analyzed the situation and found a convincing way out. Shippers are being asked merely to underwrite a rate of return to meet unspecified capital needs and are offered nothing positive for their pains save forecasts of further requests of like nature, should wage and price advances continue. Some railway executives in all departments of the business are coming to recognize the dangers and to express doubt that present policy is wise. May their views come to prevail. May the roads themselves develop a policy of constructive nature before the hour of its utility is gone. The primary responsibility rests with them.

Reports and Comments

Some Aspects of the Home - Work Relationships of Industrial Workers

MUCH emphasis has been given to the length and extent of commuting in our present-day society. New Yorkers are reported to spend $\frac{1}{5}$ of their waking hours on subways and commuting trains. Writers emphasize the severance of home and work,¹ and say, "We have become a nation of commuters in two generations, and we shall continue to be such for many years to come; 'Walk to work' is only a slogan, Autopia is here!"²

Such statements, emphasizing long time-distance commuting patterns, are misleading where factory workers are concerned. In nearly every case so far examined it is apparent that the *bulk of the factory workers live close to work and that beyond two or three miles the proportion of workers decreases as the distance from the factory increases.* (There are exceptions in the case of large, new war plants or plants with rapid, large employment expansion.) In addition, workers as a proportion of resident population diminish with distance from place of work. This pattern—so consistent—cannot be the result of chance. While we can but hypothesize as to causes, the writer believes that this is the expression of a basic tendency for man to minimize effort where possible and that this desire will, in large, aggregate choices, produce the observed distribution of workers.³ Some of the causal factors involved in this observed pattern are costs, time, chances of hearing of job openings, and location of rental housing.

It must be acknowledged that the pattern is quite different for office workers in central business districts. Here the distribution of worker's residence will tend to approximate that of the total city population. While we are concerned with factory employment, it must be pointed out that the same principles

may be operative in the distribution of office workers but less marked because of transport orientation. And, since the central business districts are nearly always the major employment foci, these may, in their nodality function, be the basis for the general pattern of total population distribution in much the way that off-center factories provide a nodal focus for their employee population. Factual proof of these statements is available but we ask the reader to accept them as essential background in order to move to a particular case study.

In 1942 the Massachusetts State Planning Board undertook a survey of manufacturing establishments all over the state. The results of this survey were punched and tabulated and the writer was fortunate in obtaining them for his use.⁴

On all questionnaires returned by employees the following items were coded and tabulated: (1) nature of product, (2) location of plant, (3) total number employees, (4) place of residence of each employee responding, (5) distance to work one way, (6) method of transportation, and (7) would the respondent move closer to work? This was an extraordinary opportunity to inquire into the effect of differences in plants and differences in communities as they might affect patterns of employee residence and travel.

The data had some limitations: (1) The distances used were measured from the community of residence to the plant site. Thus a single distance would apply to all workers living in a specific place, whereas we are quite sure that there would be a reduction of distances if individual residences were used. (2) The place of residence may have been

¹ This statement is influenced by and reinforces the finding of George Kingsley Zipf—see "The Hypothesis of the Minimum Equation," *Sociological Review*, December 1947, pp. 627-650.

⁴ Thanks to the help and cooperation of Miss Elizabeth M. Herlihy, Chairman of the Planning Board and Harold J. Duffy, Senior Planning Engineer.

¹ Kate K. Leipmann, *The Journey to Work* (New York: Oxford University Press, 1944).

² Leslie Williams, "Traffic and Housing," *Appraisal Journal*, October 1948, pp. 495-500.

TABLE I—DISTRIBUTION OF 72,048 INDUSTRIAL EMPLOYEES OF 233 INDUSTRIES IN MASSACHUSETTS BY METHOD OF TRANSPORTATION AND DISTANCE TRAVELED ONE WAY TO WORK (June 1942)

Mileage	Method of Transport							Un- known (0)	Total
	Auto (1)	Bus (2)	Trolley (3)	Train (4)	Walk (5)	Bicycle (6)	Other (7)		
Less than 1...	2,571	490	87	24	4,029	35	0	15	7,254
1-1.9.....	7,126	1,483	543	33	8,819	154	3	70	18,231
2-2.9.....	4,962	1,768	780	82	2,691	46	0	33	10,362
3-3.9.....	5,697	1,492	568	54	578	27	1	29	8,446
4-4.9.....	2,730	471	517	19	113	6	0	15	3,871
5-5.9.....	3,106	712	369	42	32	7	1	10	4,279
6-6.9.....	2,734	332	289	43	35	7	0	14	3,454
7-7.9.....	1,754	158	199	53	8	2	2	5	2,181
8-8.9.....	2,266	261	438	28	15	3	0	6	3,017
9-9.9.....	1,078	73	43	15	19	2	0	2	1,232
10-10.9.....	1,138	66	39	11	133	2	1	5	1,395
11-11.9.....	941	58	20	8	3	0	0	2	1,032
12-12.9.....	706	37	16	6	1	0	0	1	767
13-13.9.....	537	20	25	7	0	0	0	2	591
14-14.9.....	645	11	7	7	2	0	0	0	672
15-15.9.....	457	8	2	6	1	0	0	2	476
16-16.9.....	353	4	3	1	1	0	0	0	362
17-17.9.....	298	7	6	6	1	1	0	2	321
18-18.9.....	280	18	4	4	1	1	0	0	308
19-19.9.....	148	8	1	2	1	0	0	1	161
20-24.9.....	715	18	5	5	8	1	0	0	752
25-29.9.....	204	4	2	2	7	0	0	0	219
30 and over*	2,177	264	38	22	149	7	0	8	2,665
Total.....	42,623	7,763	4,007	480	16,647	301	8	225	72,048

* This includes workers reporting distances over 30 miles and those for whom no distance was reported.

improperly reported in some cases. For example: the respondent may have given Worcester as his residence whereas he actually went home only for week ends and lived in a rented room during the work days of the week in Boston. Many of these cases were corrected by checking their means of transportation. If the person indicated that he walked forty miles an obvious correction was in order. At the same time, persons may have reported the principle name of a city or town (e.g., "Boston," as

the place of residence rather than a particular subdivision of that city or town (Allston) so that a small number of variations will have occurred due to inaccurate replies. (3) The imminence of rationing at the time⁵ and the fact that randomness was not controlled in the sampling may have produced some bias in the sample and in the replies.

It is felt that, in spite of these limitations, the sample was sufficiently large and accu-

⁵ Rationing was first instituted on May 5, 1942, about the time questionnaires were distributed.

TABLE II—DISTRIBUTION: 72,048 WORKERS IN 233 INDUSTRIES IN MASSACHUSETTS, ACCORDING TO DISTANCE ONE WAY FROM HOME TO WORK
(June 1942)

Distance Home to Work	As Tabulated			Corrected		
	Number Employees	%	Cumulative %	Number Employees	%	Cumulative %
Less than 1 mi.	7,254	10.1	10.1	19,837	27.5	27.5
1-1.9.....	18,231	25.4	35.5	9,559	13.2	40.8
2-2.9.....	10,362	14.4	49.9	7,625	10.6	51.4
3-3.9.....	8,446	11.8	61.7	7,841	10.9	62.3
4-4.9.....	3,871	5.4	67.1	3,752	5.2	67.5
5-5.9.....	4,279	5.9	73.0	4,240	5.9	73.4
6-6.9.....	3,454	4.8	77.8	3,412	4.7	78.1
7-7.9.....	2,181	3.0	80.8	2,171	3.0	81.1
8-8.9.....	3,017	4.2	85.0	2,999	4.2	85.3
9-9.9.....	1,232	1.7	86.7	1,211	1.7	87.0
10-10.9.....	1,395	1.9	88.6	1,260	1.8	88.8
11-11.9.....	1,032	1.4	90.0	1,029	1.4	90.2
12-12.9.....	767	1.1	91.1	766	1.1	91.3
13-13.9.....	591	.8	91.9	591	.8	92.1
14-14.9.....	672	.9	92.8	670	.9	93.0
15-15.9.....	476	.7	93.5	475	.7	93.7
16-16.9.....	362	.5	94.0	361	.5	94.2
17-17.9.....	321	.4	94.4	319	.4	94.6
18-18.9.....	308	.4	94.8	306	.4	95.0
19-19.9.....	161	.2	95.0	160	.2	95.2
20-24.9.....	752	1.0	96.0	743	1.0	96.2
25-29.9.....	219	.3	96.3	212	.3	96.5
Over 30.....	2,665	3.7	100.0	2,509	3.5	100.0
Total.....	72,048	100.0	100.0	72,048	100.0	100.0
Median.....	3.0 miles			2.9 miles		

rate to stand inspection and to reflect the actual patterns. About 160,000 questionnaires were returned from 267 industries. These constitute over 25 percent of an estimated 630,000 industrial employees in the state as of the time of the survey. Not all questionnaires were coded; so that in most cases 72,048 were used. These represented 233 industries.⁶

⁶ One hundred sixty thousand six hundred sixty-five individual workers from 267 industries were analyzed in the original report by the State Planning Board, *Transportation*

Table I gives a summary of the distribution of all workers in the sample taken by mileage and by method of transport. This illustrates our original observation that the bulk of factory workers live close to work and the

Survey—Summary Sheets Means of Transportation (Boston, September 1942), 11 pp. mimeographed. Of these: 3,120 schedules from 10 industries had replies obviously in error and these were discarded; 46,138 schedules from 4 industries were available in separate summary form and were used where possible; 23,847 schedules from 20 industries could not be located and were apparently lost; 15,512 replies from the U. S. Navy Shipyard were not available (16,971 replies were.)

proportion of workers diminishes as distance from plant increases. This is more impressive since the amount of area included in each increment of distance from plant increases as the square of the distance. (See Table I).

At the same time, we have a chance to test the reliability of reporting by observing the choices as to methods of transport at varying distances. On Chart I we have shown the

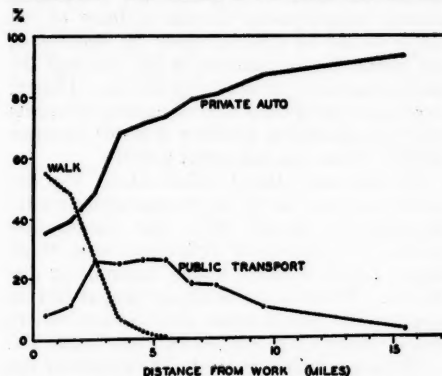


Chart I—Percent of Workers Using Types of Transport at Various Distances from Work (Massachusetts) 1942

proportion of workers choosing various means of transport at selected distances. This represents a wide range of industries—the pattern would be different for just those industries located in Boston. Public transport is used largely in the two to six mile zones. Beyond about six miles the time required to travel by bus or street car becomes increasingly prohibitive. Proportion walking changes rapidly in the close-in areas with large proportions walking within two miles of the plant. Percent using automobiles increases steadily with distance from plant. Private autos provide the quickest but most expensive method.

This pattern of use provides a check on the accuracy of our data. In general, it agrees

with many other surveys.⁷ There are obvious errors. Certainly, no one walks over 20 miles to work nor can they take a trolley such a distance. In Table II an arbitrary correction is made placing all walkers in a zone of less than one mile and all bicyclists in a zone of one to two miles. This will, it is felt, provide a generally more accurate picture and correct some of the errors made in reporting, as indicated above. This correction was made in obtaining median distances for individual plants. It will be noted that there is no substantial change from the figures as reported with the exception of the zones under two miles.⁸

We would like to report on the results of these questionnaires under five headings—(a) willingness to move closer to work; (b) differences in distance patterns due to plant size; (c) differences due to geographic location; (d) differences due to city size; and (e) differences due to different types of industries.

A. Willingness to Move Closer to Work. Since the questionnaire asked whether employees would move closer to work⁹ we have analyzed these responses with the supposition that the willingness to move would increase with distance from plant. This was generally borne out.¹⁰ We have evidence here that the choices of workers would tend toward reduction of distance from home to work. If we had evidence of those who would also change jobs in the event of transport difficulties for a more easily reached place of work we would probably have even stronger proof of the operation of this general tendency. There is a certain amount of evidence available to support

in a zone less than one mile compensates for some of the maldistributions due to reporting by other forms of transport.

⁷ There were ten questions on the schedule. The questions were aimed at determining the effect of rationing on transportation. Last questions were aimed more at auto owners. Number 8 asked: "If your tires become worn out, and you are unable to replace them, what means of transportation will you then use?" Number 9 asked: "How far from your home to the nearest transportation?" Number 10 was: "Would you move nearer to your work? Yes. No." This wording may have confused the responses.

¹⁰ This willingness to move is further substantiated in the case of the Bethlehem Steel Company shipyard workers. Employment had quadrupled by June, 1942 to over 21,000 workers. The mileage distribution of these workers was greater than the typical or average distances in the sample—median distance was almost five miles. In this case, of those returning questionnaires (12,194), 72 percent answered the question as to the willingness to move nearer work: 19 percent of those replying indicated they would move closer. This is 13.7 percent of all replies which can be compared to 9.15 percent of all replies in above sample.

¹ For example see: Kelker, DeLeuw and Co., *Report and Recommendations on the Routing of Street Railway Lines and Methods for the Improvement of Traffic Conditions in the City of Baltimore*, Baltimore, Williams & Wilkins Co., 1926; also, McClellan & Junkersfeld, *Report to the Public Utilities Commission, District of Columbia, 1925 Transportation Survey*, Washington, D. C., 1925—2 volumes; and *Report on Transportation in the Milwaukee Metropolitan District to the Transportation Survey Committee of Milwaukee*, Milwaukee, 1928, 2 volumes.

⁸ We know that, in general, all workers coming from a particular place will be concentrated closer to the plant site than is typical of the total population of that place. We know, too, that some persons will walk farther than one mile but not the proportion indicated. Thus, placing all walkers

TABLE III—PERCENTAGE OF WORKERS IN CERTAIN INDUSTRIES WILLING TO MOVE NEARER IN CASE OF TRANSPORTATION DIFFICULTIES*

Distance: Home to Work	Total Workers	Those Answering "Yes"	% of Total Answering "Yes"
0-4.9 miles.....	48,097	3,415	6.96%
5-9.9 miles.....	15,392	1,762	11.45%
10-14.9 miles.....	4,915	725	14.75%
15-19.9 miles.....	1,816	313	17.24%
20-24.9 miles.....	789	189	23.95%
25-29.9 miles.....	222	41	18.47%
30 miles & Over**.....	2,937	433	14.74%
Total.....	75,168	6,878	9.15%

* Unfortunately, we do not have a tabulation of those answering "no" and those not answering.

** Those reported as over 30 miles included many erroneous questionnaires. This is borne out by the fall in proportion of those willing to move, in the over-30-mile category. See also Table I which shows walkers and public transit riders in this category.

these findings. It was found in the study of the distribution of workers about two newly formed war plants that, in the space of one year or so, the pattern of distribution had tightened considerably. In the case of the Willow Run Bomber Plant the following table shows distribution by 10-mile zones at two different dates.¹¹

Distance Zone	% of Total Employees	
	Sept. 30, 1942	May 6, 1943
0-10.....	26	40
10-20.....	21	21
20-30.....	25	27
30 and over....	28	12
Total.....	100	100

TABLE IV—INDUSTRIES GROUPED BY SIZE OF EMPLOYMENT

Group Size	No. Industries	Question- naires Returned	Median Mileage	% Walk	% Employees Within 5 mile Radius
5,000-9,999.....	3	12,373	3.59	20.9	64.3
1,000-4,999.....	23	24,321	2.39	24.5	74.5
500-999.....	25	10,422	2.00	28.1	70.7
250-499.....	40	8,276	2.15	27.8	70.6
100-249.....	67	6,465	1.72	28.2	74.0
Under 100.....	69	2,324	2.13	24.2	71.6
Sub Total.....	227	64,181	2.53	25.2	71.3
Total*.....	237	118,185	3.47	17.8	62.0

* Ten plants are excluded from classification—four because of nature of data (these represent 46,188 replies) and six because of no data on total employment.

In the case of the Kaiser Steel Company Plant at Fontana, California, the company reported 30 percent of employees living in Fontana in 1947 and 41 percent living there in 1948.¹² In section E, below, we show that older plants have a closer distribution of workers than new.

While employees may move closer to work, we also expect that the probability of a person finding employment in the vicinity of his home would be much greater (a) because of the probability of hearing of the job and (b) the probability of applying for it. Hence, over a period of time a combination of events will be expected to produce a stable distance pattern about an industrial plant.

B. Differences Due to Plant Size. We expected that the size of plant measured by total employment would affect the distribution pattern of employees' residences with those larger plants showing longer commuting distances. There is no evidence that it has an appreciable effect upon distribution where size is under 1,000 employees. See Table IV.

If each industry is treated as a unit by determining the distance at which 50 percent of the employees live (median distance), and if industries are grouped by size of employment and the median industry of the group used, we have additional evidence as to the importance of size on home work distances. This method gives comparable results to that used

¹¹ A. H. Hawley, "The Willow Run Area—A Report by the Willow Run Community Council," June 30, 1943. (Unpublished typewritten report: data from Ford Motor Company.)

¹² Correspondence with plant personnel, also reported in *The Fontana Herald*, July 15, 1948, page 1.

above and provides a check on the excessive influence of industries with larger number of responses. See Table V.

TABLE V—MEDIAN PLANT BY PLANT SIZE GROUP AND BY MEDIAN DISTANCE HOME TO WORK OF EMPLOYEES*

Plant Size Group	Number Industries	Median Distance Home to Work of Median Industry
Over 10,000 Employees.....	3	4.9 miles
5,000-9,999 Employees.....	4	4.2 miles
1,000-4,999 Employees.....	25	2.3 miles
500-999 Employees.....	25	2.2 miles
250-499 Employees.....	40	2.1 miles
100-249 Employees.....	67	1.9 miles
50-99 Employees.....	37	2.7 miles
Less than 50 Employees.....	32	1.9 miles
Total.....	233	2.2 miles

* Four industries could not be classified.

Up to a point there seems to be little evidence that size is important as two of the three largest employers represent plants newly swollen by war expansion—the two largest being the U. S. Navy Yard, and the Bethlehem Shipbuilding Corporation. Actually, General Electric Corporation, the third plant with over 10,000 employees, has a median mileage of 2.1 miles. In the next group are the U. S. Arsenal with 50 percent of its employees traveling over eight miles to work, and Pacific Mills with 50 percent of its employees within one mile. The difference again points up the influence of a war plant in this category. These larger industries were

nearly all in the Boston district and, therefore, subject to geographical influences (see C below).

A tentative conclusion would be that size materially affects employee distribution only when, in terms of the available labor market, the size is excessive. It is further postulated that this condition would require relatively higher wages to overcome the friction of distance and that, given a steady level of employment over a period of time, the large plants would assume a pattern similar to smaller ones. This is generally borne out by examination of fairly stable employment patterns of industries employing over 10,000 persons.

C. Differences in Geographic Location. In plotting the median distances of all industries according to population size of community in which located, it became apparent that those industries located within the metropolitan district of Boston (as defined by the Census) had substantially greater commuting distances than those outside of this area. For 237 industries, the median distance of each industry was determined and the industries were distributed according to their medians, as shown in Table VI.

It is reasoned that the metropolitan area—providing a more fluid and larger labor market, plus better transport facilities—may be a factor in increasing traveling distances. On the other hand, this may mean that a change in job does not nearly so often require a change in residence within this area. Also, residential areas may be much more highly

TABLE VI—MEDIAN DISTANCE TO PLACE EMPLOYED: ALL PLANTS ACCORDING TO PLANT LOCATION

Distance	Boston Metro- politan Area		Non- Metropolitan		Total	
	No.	%	No.	%	No.	%
Less than 1 mile.....	9	9	25	18	34	15
1-1.9.....	24	25	53	39	77	31
2-2.9.....	20	20	20	14	40	18
3-3.9.....	16	16	13	9	29	12
4-4.9.....	13	13	9	6	22	9
5-5.9.....	9	9	10	7	19	8
6.0 and over.....	7	7	9	6	16	7
Total.....	98	99	139	99	237	100
Median industry in group.....	2.9 miles		1.9 miles		2.2 miles	

* 83 cities and towns as defined by U. S. Bureau of the Census.

specialized thus creating larger distances from workers' dwellings to specific industries. Large portions of the area are devoted to highly-zoned residential areas. At the same time, there is a specialization or concentration of work places so that certain areas are very heavily industrialized and thus create greater distances than would obtain in a smaller, more self contained city. In 1940 the Boston Metropolitan District contained about 2,300,000 persons, whereas the balance of the state had about 2,000,000.

D. Differences in Commuting Patterns by Size of City in Which Plant is Located. These measures are obviously rough and refinement is needed. However, the findings are extremely suggestive as to the importance of city size, and would merit more exploration. With no regard to the size of industry (we have established that this is of relatively little significance) we have determined the median distance of the plants in each size of community. Again, using a rough measure, we have analyzed the distances by calling each industry a unit and using the median of these units as the measuring stick. Table VII summarizes our findings.

The consistency of this distribution suggests the possibility that there is an optimum-sized community for home-work relationships. A check of the 182 industries with more than fifty percent of the total employees responding shows identical distribution with a more marked low point in the 10-50,000 groups.

For the sake of comparison all respondents were classified by size of city of plant location and totaled. See Table VIII. The difficulties

in this type of comparison are due to the fact that weighting is excessive for large industries and the weight of any industry should be its total employment—not the number of replies actually received. Here the 10-25,000 size group shows a marked advantage. This does agree, in general, with Table VII.

TABLE VII—MEDIAN DISTANCE TO PLACE OF EMPLOYMENT BY SIZE OF COMMUNITY

Population Size*	No. Industries	Median Distance to Industries
Boston (770,816).....	20	3.1 miles
100,000-200,000.....	31	2.7 miles
50,000-99,999.....	19	2.1 miles
25,000-49,999.....	26	1.9 miles
10,000-24,999.....	52	1.6 miles
5,000-9,999.....	40	2.3 miles
Under 5,000.....	48	2.6 miles
Total.....	237	2.2 miles

* According to 1940 U. S. Census.

It is reasonable to believe that a city large enough to supply the quantity and diversity of labor for a particular plant and yet small enough to allow reasonable commuting distances should have the shortest commuting pattern. An interesting coincidence is the general agreement of this data with the cost of furnishing government services in different sized communities. In Massachusetts in 1940, the per capita cost of city operations was as shown in Table IX. Both sets of data point to an optimum-sized city at about 10-20,000 population. Whether or not this is the case requires much more research. The difference between a city the size of

TABLE VIII—MEDIAN DISTANCE—HOME TO WORK OF ALL EMPLOYEES CLASSIFIED BY SIZE OF CITY OR TOWN OF PLANT LOCATION

Population Size—City or Town	Number of Industries	Number of Employees Responding	Median Mileage of Employees	Those Walking		% Total Employees Living Less Than 5 Miles
				No.	%	
Boston.....	20	23,178	4.7 miles	2,124	9.2	54.3
100,000-Boston.....	31	17,090	3.4 miles	2,644	15.4	65.1
50,000-99,999.....	19	34,168	3.0 miles	5,594	16.4	60.9
25,000-49,999.....	26	17,459	3.8 miles	2,914	16.7	58.4
10,000-24,999.....	52	10,062	1.7 miles	3,426	34.0	80.6
5,000-9,999.....	40	7,822	2.2 miles	2,183	27.9	71.4
Under 5,000.....	48	8,406	3.8 miles	1,900	22.6	57.0
Total.....	237	118,185	3.5 miles	20,785	17.6	62.1

TABLE IX—COST OF GOVERNMENT EXCLUSIVE OF INTEREST, OUTLAYS, DEBT RETIREMENT AND PUBLIC UTILITIES*

Size Group	Number Places	Population 1940	Expenditure for Operation & Maintenance of Gov't 1940 (in thousands)	Per Capita Costs—1940
Boston.....	1	770,816	\$ 66,238	\$ 86
100,000—Boston.....	7	883,462	52,835	60
50—100,000.....	8	565,315	33,321	59
25—50,000.....	16	623,963	36,443	58
10—25,000.....	45	709,904	35,588	52
5—10,000.....	48	352,992	17,573	50
Under 5,000.....	226	410,269	24,694	60
Total.....	351	4,316,721	\$ 267,692	\$ 62

* Commonwealth of Massachusetts, Department of Corporations and Taxation, *Statistics of Municipal Finance, 1940*, Public Document No. 79, Boston, Massachusetts, July 1, 1942. The item used for comparison is called "Departmental Maintenance"—all accounting systems are standard and fiscal years are the same for all cities and towns.

Boston and smaller places is marked and significant. Within the data on cost of government we are assuming a dollar expended receives a dollar of service and, therefore, smaller places require fewer services.

We should suppose that, since distance home to work appears to be farther and government costs greater in a large city, there must be some compensation to offset these disadvantages.

E. Comparison of Industries by Nature of Product. There is one additional comparative point that needs examination. It was expected that the low-wage, old types of industries would have a closer distribution of workers than the newer, more highly specialized and higher wage types. Industries were broken down on the basis of product into six

categories. All workers were analyzed by industry, by town size and by location in or outside the Boston Metropolitan District. It was found that the pattern described below held, regardless of the previously described tendencies, the only difference being that more of the specialized types of industry were found in the city of Boston. This was not a large enough influence to affect the results shown in Table X.

The textile, shoe and leather, and paper groups exhibit common tendencies toward closer distribution of workers and higher proportion walking to work. We would expect this because: (a) the relatively lower wage characteristics of these industries would make economy of trip more important; (b) they are the older industries in Massachusetts and,

TABLE X—DISTRIBUTION OF ALL WORKERS BY TYPE OF INDUSTRY

Type Industry	Total No. Plants	Number Employees	% Walking	% Within 5 mi. of Plant	Med. Distance All Workers
Textiles.....	28	8,856	39.3	77.8	1.41 miles
Leather & Leather Products..	17	4,554	37.0	77.8	1.43 miles
Paper & Allied Products.....	16	3,542	39.3	79.4	1.62 miles
Machine Tools.....	26	4,514	22.9	70.6	2.73 miles
Machinery.....	46	19,823	15.8	64.0	3.40 miles
All Other.....	101	30,759	19.2	62.8	3.28 miles
Total.....	233	72,048	23.0	67.1	2.91 miles

therefore, have over a time period concentrated their employees' residences in the neighborhoods of the factories; and (c) the skills for working in these plants are more commonly held by the resident population than skills for working in the newer plants (this includes the propensity for employing married women who generally will not travel far to work). The wage characteristics of the six groups are reconstructed in Table XI.

TABLE XI—COMPARATIVE WAGE SCHEDULE BY INDUSTRY GROUP—MASSACHUSETTS INDUSTRIES* (May 1942)

Industry Group **	Total Compensation 1942— in thousands of dollars	No. Employees on Payroll last Week in May	Calculated Annual Wage
Textiles.....	\$ 212,592	\$ 135,644	\$ 1,570
Leather Products.....	103,819	73,431	1,420
Paper & Allied Prod....	42,881	24,460	1,750
Machinery.....	108,822	42,680	2,540
Machine Tools.....	88,848	34,307	2,575
All Other.....	945,019	454,048	2,080
Total.....	1,501,981	764,570	1,960

* Commonwealth of Massachusetts, Division of Employment Security, *Employment and Wages for Year 1942—State Summary by Major Industry Divisions* (Boston, Massachusetts, 1943).

** These totals represent selected groups under each heading.

This provides a rough indicator of wage levels and agrees very closely with the distinctions in travel and residence patterns indicated above.

Summary

We have established evidence of the tendency on the part of workers to minimize the distance between home and work. We have shown that, over time periods of stable employment, the pattern will tend to "tighten up"—e.g., those workers living at great distances will move closer to work or find other jobs closer to home.

We have indicated a greater distance pattern in the densely populated metropolitan area. This is believed due to job specialization and to specialization of neighborhoods—both of which are possible because of

improved transit facilities in this area and to large population concentrations.

We have established that only the very large plants (probably over 5,000 employees) tend to have larger, typical commuting distances. This characteristic may or may not be due to the size of the plant. (Actually—in all size ranges up to 1,000 or 4,000 employees there seems to be no appreciable size influence).

We have uncovered the suspicion that there is an optimum-sized community when measured by patterns of worker's travel distance and that by a curious coincidence the differences between different size groups of communities in regard to commuting distance is similar to differences in per capita costs of government.

Other implications in these findings suggest that a low wage industry cannot attract workers for long distances—that this requires unusually high wages. There is the possibility of defining a probable labor market and of estimating the location of the labor force for any new industry introduced into a community.

There are planning implications here in that we have described a basic tendency on the part of workers and have given this some measure. We have also suggested the possibility of an optimum-sized community. Of special importance to housers and planners is this marked tendency to live close to work in the case of the lower wage type industries. This may be a major force in creating overcrowding in the vicinity of factories and may be more important than the smoke of the factory in producing blight, deterioration and overcrowding adjacent to plant sites. Perhaps the vicinity of work places should be carefully planned as well as asking for smoke abatement ordinances.

Above all, by a method of empirical analysis, we have uncovered some hypotheses which can be tested in further research.

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The Problem-Solution Basis of Forward Pricing

Some months ago Mr. Parsons agreed to review *Forward Prices for Agriculture*, by Gale Johnson, for this journal. When Mr. Parsons' paper came in it was apparent that he had thought this book of sufficient importance to warrant a more extended analysis of the issues presented than is usually done in a book review. We are happy to publish his commentary. (Editor)

PROFESSOR Gale Johnson in his *Forward Prices for Agriculture* (University of Chicago Press: 1947) has developed the most comprehensive statement so far of the theory and problems of forward pricing as a possible price policy for agriculture. Johnson's book, therefore, is significant, not only as the presentation of a thesis, but also as a summary and integrated statement of what one might call a "school of thought" in agricultural policy as it has developed at two of our major educational institutions over a decade.

I

The main thesis is so well known as to make any extended comment here unnecessary. In general, forward prices are anticipated and projected equilibrium prices. "Forward prices would represent the best possible estimate (or some large fraction thereof) of the price which demand-and-supply conditions would actually dictate." (p. 133)

These projected prices when viewed as a whole, as a forward price system, would have two major characteristics: "(1) the estimation of the anticipated prices for at least a production period in advance and (2) a direct offer on the part of the government to assure farmers of receiving the anticipated prices or some major fraction of them. The basic purpose of a forward price system is to reduce and/or transfer the amount of price uncertainty confronting farmers." (p. 132)

The forward price, then, is not just a predicted equilibrium price; it is an authoritative price, set by a group of experts for the purpose of evoking just the right amount of production to permit the general conditions of equilibrium to be achieved; an equating of demand and supply according to the refined criteria of marginal adjustments of costs and returns, maximizing returns to producers and at the same time giving consumers maximum satisfaction under the existing conditions of tastes, income distribution, and so on.

Johnson's proposals run in terms of minima rather than exact points of equilibria, thereby permitting producers to realize higher than equilibrium prices, but not lower than the announced floor price.

He recognizes the technical problems of anticipating prices far in advance of production. Consequently he is inclined toward a long-time floor of something like 75 per cent of the projected equilibrium price. I am not certain that I understand his argument completely on this point, but he speaks of forward prices fanning out over the longer future from the equilibrium prices of the current production period. (p. 139)

In the concluding chapters Johnson discusses the place of forward prices in the technical equilibrium sense, in a larger context of policy, which should include, in his judgment, a program for anti-depression payments, as well as crop insurance, and a number of programs which would contribute to the investment in and improvement of our rural human resources. At this general level of analysis he has excellent chapters on the theory and practice of storage and a general treatment, including estimates of costs, of sustaining total net agricultural income at various levels over a business cycle.

The general presentation is characterized by both balance and modesty. Johnson is at pains to point out the limitations of both his own project—forward pricing—as well as price policies in general within the general continuum of agricultural policy.

As one digs into the basic argument upon which the forward price proposals rest he finds a very closely reasoned presentation. In this direction one finds Johnson pulling aside issue after issue in the attempt to get down to the core of his problem. At the most general level he divides the economic problem into the resource problem and the income problem. He quickly makes it plain that prices and price uncertainty are relevant principally to the resource problem. He concludes that the two general problems of resources and income must be analyzed by different analytical tools (theories). He would analyze the income problem by welfare criteria, but the resource problem may be embraced, he concludes, within the field of particular equilibrium analysis—in short, the Marshallian system.

Consequently, Johnson is concerned, in his forward price argument, chiefly with the problem of relative prices and especially the influence of price expectations upon resource utilization. Forward prices are proposed as the solution to the resource problem in agriculture.

In the very nature of Johnson's view of the function of prices and price policy, they must deal with resource utilization. From this premise he attacks time and again the "parity price" programs for agricultural adjustment. It does seem to me, however, that as a minimum there is something of a semantic problem here. Johnson repeats many times the now familiar cliché that parity prices are backward-looking while forward prices are forward-looking. Admittedly the relation of prices to resource utilization was neither accurately nor rigorously formulated by the architects of the first A.A.A. But Johnson confuses the issue, it seems to me, by the bland assumption that since prices are mentioned the program must be judged by price-resource criteria. We should not lose sight of the fact that the parity idea is a very complex system of conceptions. At bottom the drive for the first A.A.A. grew out of a conviction that farmers and the farm economy are fundamentally at a disadvantage in an economy dominated by "groupistic" economic power. The creators of the A.A.A. reasoned by analogy from the bargaining policies of industrial groups. Now it is no answer to the problems involved in these structural issues to devise a price-resource utilization statement which ignores the great questions of relative economic power and status.

I, for one, would find a recognition of the differences in purpose and conception of agricultural policy between the early proponents of "parity" and the proponents of forward prices to be much more satisfactory than Johnson's treatment. The two "schools" have chosen different centers of focus. Furthermore, a comparative analysis of purpose and conception would be much more in keeping with both the spirit and method of Johnson's analysis.

Instead, Johnson insists that it is the function, and perhaps the duty, of agricultural economists to undermine the confidence of the public in the parity idea. (p. 10) As an incident to this assertion, it is also remarkable how completely Johnson identifies valuation

with mere feeling. The section on the "Role of Parity Prices in Price Policy" (pp. 8-10) is simply studded with "fervor," "opinion," "general feeling," "prevailing belief," etc.

Inasmuch as *Forward Prices for Agriculture* has significance as the representation of a forceful viewpoint with many proponents, it may be worthwhile to attempt some comments on the fundamental methodology of the analysis. My conclusion is that the conception of a problem is the key methodological idea in the book; implicit in this conception are positions both regarding the functions of economic theory and the treatment of valuation. In the remainder of these remarks, I shall attempt a few comments on these methodological issues.

II

Stated in simplest terms, Johnson conceives of a problem as the discrepancy between the actual circumstances and a postulated ideal. The content of the problem is the discrepancy between the actual situation and the ideal. These are the maladjustments which need to be overcome. (p. 35)

For example, he opens the analysis of the "Resource Problem," p. 88, with the following remark:

"An analysis of resource use implies a comparison of the actual use of resources with an ideal. For present purposes this ideal may be stated in terms of two simple conditions. The first condition is that the value of the marginal product of a factor is equal to the price of the factor. The second condition is that the value of the marginal product of a factor should equal the marginal opportunity cost of the factor or the factor's marginal value product in its highest alternative use. The two conditions provide a basis for dividing the resource problem in agriculture into manageable parts . . ." (p. 88)

The solution to such a problem, at the policy level, follows readily. Policy proposals, or the principles of policy, are simply suggested ways of bringing the actual situation into conformity with the "ideal." There are "three basic elements" in the conception of policy, according to Johnson (pp. 11-12):

- (1) "First is the determination of the goals or purpose of policy.
- (2) "Second is the derivation of the general principles of the operation of the policy . . . The general principles, if rationally determined, are

derived by the analytical process of comparing the idealized conditions represented by the policy goals and the actual circumstances, of determining the basic causes for a discrepancy between the two circumstances, and of developing the necessary positive steps required to eliminate the discrepancy.

(3) "The third element of a price policy is the techniques, the administrative tools . . . The actual implementation of a policy requires granting an administrative agency the power to utilize certain procedures which may be necessary . . ."

Within this general conception of "problems" and "solutions" forward pricing is the program proposed to meet the problem of the malallocation of resources. The argument is simple and direct. The function of prices is to allocate resources. This job is not done perfectly because of uncertainty. "The term 'uncertainty' is used to include all circumstances in which decisions must be made without perfect knowledge of significant future events." (p. 38) A considerable part of this uncertainty is "price uncertainty." Forward pricing is the program proposed for eliminating this price uncertainty. "However, before we can accept the desirability of forward pricing, we need positive evidence of the inaccuracy of the price expectations of producers and the effect of such inaccuracies on resource allocation." Since it is easily shown that there is inaccuracy of price expectations among farmers, and since it is accepted that "the broad objective of agricultural price policy is to improve allocative efficiency" (p. 133), the argument is complete and the solution is forward pricing.

In this very straightforward way Johnson lays bare the fundamental method of his analysis. As one would expect, it is done well, for Gale Johnson is a master craftsman in his chosen methods of economic analysis. Furthermore, the method is of general significance, for he does better what most orthodox-minded economists try to do.

Perhaps one might say that Johnson pursues the argument in a more rigorous fashion than most persons who hold similar viewpoints, for he is also distinguished by his confidence in the efficacy of economic theory in the policy context. But one can almost say that the most prevalent conception of theoretical economic analysis is of the same general character. By this line of reasoning trade unions and governmental interference are condemned as leading to malallocation of resources. The marketing "problem" is

thus viewed as the discrepancy between the actual situation, and so on. Perfect competition is taken as the general model in economics, and the world about is replete with distressing discrepancies from this ideal.

But by what warrant are these "ideals" chosen? In terms of procedure, it seems quite clear that the "models" of economic analysis are quietly shunted in as the "ideals" of policy. Economic theory is presented as a tool of analysis. These tools, when integrated in a system, are referred to as models and then by some subtle method this analytical model is transmuted into an ideal model. Nevertheless these "ideals" remain simply ideas, pure ideational constructs. The devotees of the method take them as "ideals" as an act of faith—at bottom a faith that an economy which operated like the model would be a better kind of world. I would not deny that this faith has some "works" to its credit and is sometimes justified in a fragmentary way, just because economic theory inescapably includes genuine insights into the nature of the economy. Nevertheless the acceptance of such an "ideal" as a goal of policy remains an act of faith.

It follows as a matter of implication that it is the theoretical model, when considered as an ideal, which is the basic reference point in defining a problem. As a consequence many economic "problems" have a way of turning into the same thing—the malallocation of resources. Even this conclusion might lead to sober apprehension of the method, if the devotees would examine seriously the meaning of resources. If this were done, one might be impressed that the *Wealth of Nations*, which is the fountainhead from which the conception of "economics as the maximum utilization of resources" has been selectively derived, was interpreted by contemporaries as a formulation of the economy of a natural system of liberty. But in our devotion to economics as a technique of analysis we work out our model in terms of given resources and then, when the model emerges as an ideal, we move on to practical proposals for the elimination of maladjustments (discrepancies from the model) rather than turning back to analyze the implication for "remedial" action of having assumed resources as "given" to begin with.

The actual process of analyzing a "problem" preparatory to making recommendations for policy action is something of a sort-

ing procedure. The problem is viewed as a series of parts, which are laid aside one by one. It is much as if the operation were done with a pair of dials, in this instance with one dial everything in the "problem" (including instability and economic power) except the problem is dialed out, then a finer adjustment is made to bring out the problem of uncertainty. With the other hand the goals are dialed until price certainty is in focus. Then the solution of the "problem" is viewed as a simple connection between these two points. But unless I am mistaken what we have here is simply two different ways of manipulating the same set of ideas, so that the whole affair is a verbal manipulation, contained within the one universe of speculation.

The investigation of existence within this scheme of things turns out to be a matter of finding illustrations of the theories, although this effort may be rationalized by the further assumption that the model is somehow descriptive of the facts; this, of course, is ignored (and is completely contradictory) when the model is taken as an ideal. That the model is taken by Johnson in the factual analysis as one conforming to the world of actual affairs is suggested by the following comment in the opening section of his major chapter on the "Contribution of Price Policy to Resource Problem": "As is true so many times in empirical economic investigations, we do not have at hand the data required to approximate the variables in our models." p. 87.

I hope and trust that these remarks will not be taken as a captious criticism of Gale Johnson. Quite the contrary is intended. What is at stake is a method of analysis, and this book in my judgment ranks as a masterpiece of the method which the author uses. However, the very excellence of the analysis brings into the open many issues which less careful students would have slurred over. Furthermore, the method is essentially the currently prevalent one and criticism of it runs the risk of being grossly mistaken. More important still, we should admit that a full-fledged alternative method of analysis remains to be developed. If such is done it is almost sure to be alternative only in the broad sense of general direction and orientation, incorporating the insights of conventional analysis into a broader and more adequate general scheme. The concluding remarks are intended as a few suggestions on how we might go about supplementing at

critical points the type of analysis which Johnson uses.

III

The central questions turn on the conception of a problem. To speak of problems, and of solutions to problems, has become almost habitual with the social scientist of today. But a "problem" is not a simple concept, and there are alternative formulations of the nature of a problem.

In the problem approach as developed by John Dewey, for example, a problem is always viewed as related to a real difficulty in an actual situation: the problem in this view is essentially that of a limiting factor or difficulty which is obstructing orderly or satisfying activity. The solution to the problem in this pragmatic sense is a program for removing the difficulty. As such it is a plan of action directed to a specific obstacle. In this view, the test of an adequate solution is simply in the effectiveness of the means for resolving the difficulty. In terms of public policy this line of thought would direct attention not to the discrepancy between the actual situation and some perfect or ideal state, but rather toward courses of remedial and available action which would be pointed toward specifiable difficulties.

In the pragmatic philosophical tradition, and it is in this viewpoint that the problem as a theoretical concept has been given most emphasis, the problem-solution is a strategic part of the validation of knowledge. In short, the test of the validity of knowledge is ultimately the practical one of relevance to the solution to some problem.

Such a view of a problem would deny that we could ever solve real problems by mere reference to some simple goal. The solution of problems requires overt acts, and the consequences of any act are never so simple as to be relevant to one specific goal. This suggests that our basic unit of analysis in valuation must be *acts*, past and prospect. The analysis of consequences of past action would thus be used as guides to judgments about the probable consequences of prospective acts. But certainly the centering on the construction of economic models to be taken literally as goals in policy action is not only far too simple, it is also arbitrary.

When decisions are taken regarding courses of public action in executing public policy, we are confronted with the rather appalling

fact that the same act has many different dimensions, and has consequences which run off in all directions, with an almost infinite number of involvements in actual existential affairs. The person responsible for action, if he is wise, simply tries to anticipate the major or strategic consequences, and acts with the certain prospect that some of the consequences will be undesirable and unexpected. But it is a matter of balance in practical judgment.

There is a profound and fundamental connection between the formulation of the problem and the correlative solution. This makes the task of social analysis extraordinarily difficult. It is difficult to comprehend and act upon the implications of the elementary fact that a problem is not really formulated until a solution is hit upon. Even with the conception of a problem used by Johnson, the "solution" is implicit in the formulation; in general the problem is the discrepancy, the solution its elimination. Evidently, all problem formulations carry this inherent connection with the "solution"—so much so that the solution when acted may also demarcate the problem.

For this reason, the choice of the method of problem analysis is not just a matter of preference or taste. What is involved is the very nature of "solutions" which are compatible with democracy, freedom and our social system generally—to say nothing of the fact that a collective practical judgment on public policy requires the participation of citizens, legislatures, administrations, and

even the judiciary. The "solutions" turn out to be the very structure of our social organization.

Now, when one asks what contribution economic analysis has to make to this kind of policy judgment, I would say, in principle, a whole lot more than is usually achieved. But, unless I am seriously mistaken, the full power of economic analysis cannot be brought to bear upon genuine problem-solving at the policy level, until and unless we recognize that economic theory is simply and solely a part of the methodology of investigation and does not as commonly practiced, formulate the ideals of public policy at all. However, to follow out this suggestion is a task requiring a much more extended analysis than the present essay.

If we concentrate in our valuation analysis upon acts, and their meaningful consequences, we shall of course do something quite different from this process of analytical isolation. When agricultural policy is analyzed in terms of *acts*, it is not inconceivable that even "parity" might have a respectable status, for it might turn out that the structural economic problem of agriculture in a world of powerful combinations was actually of more fundamental economic importance, even for resource utilization, than a precise outworking in day-to-day affairs of the equating of marginal costs and marginal returns on individual farms.

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Administrative Problems Under the British Town and Country Planning Act of 1947

THE passage of the British Town and Country Planning Act of 1947 met with the keen and sympathetic interest of planners in this country, as a bill which faces squarely the problems of land use control.¹ The report of the Committee on Land Policy, presented at the California meeting of the American Institute of Planners in September, 1948, reveals the influence of this bill upon the

possible future legislative goals of American planners. An editorial in the *Chicago Daily Tribune* of July 1, 1948, on the other hand, characterizes the bill as hopeless and revolutionary: "The law is about as effective a brake on progress as could be devised . . . The predictable result of all this will be to hasten the arrival of the day when only the state will be able to develop any land . . ." It is the purpose of this article to explore the possible effects of the law upon the real estate market, private development and individual

¹ American Society of Planning Officials, *Release Gen.*, 49, February, 5, 1947.

owners and to call attention to important administrative problems under the Act.²

Purposes and Provisions

The background of the law has been described at length and need not be reiterated here.³ Designed "to secure that all the land in the country is put to the use which is best from the point of the view of the community," the law may be said to have had the following more specific purposes: (1) to increase the public control over land use; (2) to eliminate land speculation; (3) to nationalize the development value in land; and (4) to increase the powers of local governments to buy land compulsorily.

The law provides that the carrying out of any building operations or the making of any material change in the use of any buildings requires prior permission from the local planning authority. The authority will generally be guided in its decision to grant or withhold permission by its development plan, which is required to be prepared and submitted to the Ministry of Town and Country Planning for approval within three years from July 1, 1948, the "appointed" or effective day for the law. No compensation is, in general, payable on refusal of planning permission. When permission is granted, a payment (development charge) will normally have to be made to the state equal to the increase in the value of the land as a result of the new development or use being permitted. Owners of any interest in land who can show a real hardship may make a claim upon the state for payment in respect of depreciation

which has occurred in the value of their land as a result of this legislation.

Claims for compensation as a result of depreciation in the value of land must be submitted to the Central Land Board before June 30, 1949. The Board will then determine the lost "development value" of each individual parcel. This is broadly defined as "the difference between the market value of the interest in the land on the basis that the Act had not been passed, and the market value of that interest restricted by the Act to its existing use."⁴ Both values are to be calculated by reference to prices current immediately before January 7, 1947. Present owners, therefore, are to be compensated for immediate loss in market value of their land as a result of the restrictions in the law. Compensation is to be paid from a global fund of £300 million established to meet all claims. Payment will be made in government stock to be issued under a Treasury Scheme. It is unlikely that this payment will be made sooner than 5 years from July 1, 1948, the time allowed for the government to sort out the claims and draw up the scheme.

Applications for planning permission and also for determination of the amount of the development charge are required to be forwarded at the same time to the local borough, city or district council in which the land is situated. If planning permission is granted, the application for determination of the development charge is forwarded to the Central Land Board by the local council.⁵ The development charge is to be measured as the difference between the market value of the land with the benefit of planning permission (Consent value) and the market value of the land without such permission (Refusal value).⁶ The term "Refusal value," which supplants an earlier term used by the Ministry of Town and Country Planning called "Existing Use value," means the value of the land on the assumption that land is used for agriculture or, if on the appointed day the land is built upon or put to any particular use, the assump-

²The author offers these comments with reserve, since they are not based upon a personal first-hand knowledge of the administration of the Act. It has been necessary, therefore, to rely upon published materials, the kindnesses of colleagues who have had such experience, and upon correspondents in Britain. The author acknowledges the assistance of Professor Robert Brady of the University of California and of Mr. Frederick R. Peake, delegate to the annual conference of the Building Societies in England, 1948. Mr. Thomas Balogh of Oxford University provided valuable assistance in obtaining copies of official documents and offering general comments upon the Act. Mr. Frank Wellings, Solicitor, London, and Mr. F. Miller of Jesus College, Cambridge, offered helpful criticism on a draft of the article. The responsibility for the opinions expressed herein rests entirely with the author.

³Reference Division, Central Office of Information, London, *Town and Country Planning*, R. 1735 (superceding R. 1483), January 1949; F. J. Osborn, "Planning in Great Britain," *Journal of the American Institute of Planners*, New Towns issue, Summer 1948; Ministry of Information, *Town and Country Planning in Great Britain*, I. O. Series, No. 920, 1949.

⁴Central Land Board, *Claim for a Payment in Respect of Depreciation of Land Values Under Section 58 of the Town and Country Planning Act, 1947*. Form S. 1.

⁵Central Land Board, *Explanatory Pamphlet on Development Charge (England and Wales)*, Form D1-A, June 1948.

⁶*Ibid.*, Section 70 (2); and, Central Land Board, *Practice Notes (First Series), Development Charges Under the Town and Country Planning Act, 1947*, London: H.M. Stationery Office, 1949.

tion that the existing use is continued as a perpetuity. It is noteworthy that, if the land is built upon, the owner has the right to replace buildings as they wear out, to convert the existing house into flats, replace any war damage, and extend buildings up to 10% of cubic content or 1,750 cubic feet, whichever is greater, without payment of any development charge.⁷

Broadened powers of eminent domain (compulsory acquisition) established under the 1944 Act are retained and substantially strengthened under the 1947 law.⁸ Land "designated" for acquisition within ten years (the period is varied to 7 years for agricultural land and land in New Town areas) may be acquired by the local district council or by the Central Land Board by agreement or by compulsory acquisition procedure. Compensation for land so acquired after August 6, 1947 will be based upon Refusal value.

Financial Effects

Although the possible repercussions of such a law are endless and the administrative latitude permitted by the Act is tremendous, two hypothetical cases may be assumed for appraising the probable effects of the law upon property owners and developers and the administrative problems which may be expected to arise in connection with the Act.

Case I. An owner has 10 acres of land outside of town, now used for agricultural purposes. The land had a market value on the date of purchase by the present owner (1946) of £1000, against which a loan of £500 had been secured from the purchaser's bank. A developer wishes to acquire the land for development in February 1949 and takes the following steps in compliance with the law. First, the owner applies to the Central Land Board for compensation claim as a result of depreciation in the value of the land owing to restrictions in the law. The owner may have taken this step earlier, but in any event must make claim before June 30, 1949 to be eligible for any payment. Second, the purchaser applies to the local council for permission to develop and for determination of the amount of the development charge.

Assuming that development is permitted, the developer would be required to pay a development charge before the land is developed. The Central Land Board will calculate the development charge as the difference between Consent and Refusal value as of the time of application. In the calculation of these values, the Board will assume a sale takes place between a "willing" buyer and seller under conditions that permission is granted (Consent value), and refused (Refusal value). Under the assumption that no change had occurred in market values since 1946, it can be estimated that the Consent value was fixed at £1000 and the Refusal value, based upon the continuance of use as agricultural land, fixed at £200, thus fixing the development charge at £800.

The developer will probably offer the present owner about £200 for the land, i.e., the difference between the value of the land to him with planning permission and the amount of the development charge. The owner considers the amount of expected compensation under the law from the global fund and his obligation to the bank on the loan of £500. Owing to the fact that his obligation to his bank will be an immediate one in the event of sale, and since he does not know what his compensation will be from a global fund payment probably not available for another five years, the owner will likely refuse to sell at the lower price. His decision will be influenced by the knowledge that the amount received as compensation is limited to a share in a fixed global sum of £300 million, an amount considered by many to be inadequate.⁹ He will further consider that the amount of his compensation from this fund will be calculated upon market value before the Act was passed and hence will not reflect subsequent rises in land values resulting from market influences, currency and other conditions. Devaluation of the British pound in 1949, for example, may result in higher prices for developed land but probably will have only unfavorable consequences for the owner in Case I.

Under conditions of high and active demand for shelter, it can be expected that developers will offer owners in excess of Refusal values. Under the present circumstances it might be expected that the developer would

⁷ Ministry of Town and Country Planning, *Town and Country Planning Act, 1947, "Explanatory Memorandum," Part I., General Notes* (London: H.M. Stationery Office, 1947) p. 14.

⁸ *Town and Country Planning Act, 1944* (London: H.M. Stationery Office, 1944).

⁹ The Building Societies Association, "Supplement to the Information Letter," *Town and Country Planning Acts, 1947*, April 1948, p. 5.

raise his bid for the land above £200—limited of course, by the prospective total margin of profit in the sales of the homes he plans to erect on the land. The Building Materials and Housing Act, 1945, which limits the selling and letting prices of properties erected under license in England, should prevent the prospective developer from passing on the added land costs in higher housing costs to the consumer. It has been predicted that builders faced with this squeeze would have alternatives of reducing the cost and quality of construction or giving up building altogether.¹⁰ Under altered circumstances in the market the owner of undeveloped land may be expected to sell his land at Refusal value or be forced to hold it. The effect of the current large demand for land can be noted in a report from England that "land is being bought and sold today with little, if any, regard to the Act."¹¹

The effect of the Act upon development by present owners and the particular influence of the compulsory acquisition provisions of the law can be observed from a second example.

Case II. Assume that an owner has a middle aged house situated on land ripe for development as a multi-family location and that the borough council wishes to effect the master plan development in this area. The owner has several alternatives: (a) he may continue the existing use pending acquisition; (b) he may pay the development charge and erect a multifamily structure; (c) he may sell the property to another developer; (d) he may sell the land by agreement or compulsory acquisition to the local government or to the Central Land Board; or he may convert to a multi-family use. Since the law permits an owner to convert a house into flats and extend its size by approximately 10% without payment of a development charge, the owner would have real incentive for taking advantage of these provisions of the law.¹²

Threat of compulsory acquisition will greatly influence the decision of the owner in Case II to sell or develop his property. Since the property under discussion is ripe for development and might have already been designated for acquisition by the local authorities at Refusal value, the owner might

find himself in a very unfavorable market situation. He has little incentive to develop himself, yet if he does not develop or sell, he may be subject to compulsory acquisition at nominal value. The market price offered him for his land might be expected to reflect this unfavorable situation, contrasted with the relatively favorable market situation of owners of land already developed as multi-family property. Since no planning permission or development charges are levied against land already developed when continued in its present use, the value of developed land may be expected to advance relative to undeveloped land ripe for development. This trend would be magnified if the effect of the law is to deter land development.

Administrative Problems

The effects of the Town and Country Planning Act, 1947, cannot be isolated from those of the rent control laws, the Materials and Housing Act, 1945, and the British Tax Law. Mr. Frank Hellings, a London solicitor, has recently commented on the combined effect of legislative controls upon private development in England as follows:

"The private development of land is so far discouraged at the present time that it is almost at a standstill. The big Building Contractors are building in Ireland and the Dominions—even in America—but not all of this is due to the Town and Country Planning Act. A lot of it arises out of the licensing situation which permits only a ratio of one house built by private enterprise to four built by local authorities. The local Authorities' methods of inviting tenders and the nature of their contracts (both imposed on them by the Ministry of Health) make it impossible to execute these contracts with much hope of breaking even. The Town and Country Planning Act with its nationalization of development values was the last straw. The big Contractors are sitting on the fence until they see how matters turn out, and, in particular, how far their claims for compensation and for favorable treatment as Registered Builders will keep them on an even financial keel."

¹⁰ An actual case cited in correspondence with individuals affected by the Act illustrates the force of these incentives: "The owner of a small haulage business on the outskirts of a city decided there was a need for a garage and small refrigerated store adjoining his existing building and applied for planning permission. He received a demand for £1300 as a development charge, and, of course, decided not to go ahead but to content himself with a small addition to the building under the 10 percent floor area rule, free of development charge."

¹¹ Letter to editor, *The Economist*, September 28, 1948.

¹² Frank Hellings, *The Town and Country Planning Act, 1947, Its Financial Effect* (unpublished, mimeograph) 79 Cannon Street, London; and "Planning Act in Difficulties," extract from *The Economist*, September 25, 1948.

The financial consequences of the Act for property owners, will depend, of course, upon the amounts of the development charge and compensation claims fixed and upon the extent to which the government uses its powers of compulsory acquisition. The text of the Act, explanatory memoranda and claims forms issued by the Central Land Board provide little basis upon which an individual owner can assess these factors. An early comment upon the bill stated: "To attain its objective cheaply, the Bill deals summarily, and not a little harshly, with the landed interests which block its path, and it is also guilty of the common and grievous Labor sin of leaving vital details to be filled in by government decree at some later date."¹³ The significance of the administrative problems arising under the Act can be noted from current reports from England.

A correspondent in one of England's Universities has written:

"... I must say I do not know what the effects (of the Act) will be as I do not know on what basis the charges will be made. It seems that Inland Revenue Estimates of value will be used: they are out of date and equal about 30%-50% of the present value. On that basis the (development) charge will merely reduce profits by 20%-50%. But I think in each case there will be haggling—the developer will plead his case and the reduction might be less."

The probability of this type of negotiation is suggested by the form used by the Central Land Board for determination of the amount of development charge, which states in part 7, "If you wish to make an offer of the amount of development charge you are prepared to pay, state the amount you offer."¹⁴

There appears to be reluctance on the part of many property owners to commit themselves to any estimates of value affecting their property, since a low estimate of Refusal value might work to their disadvantage in case of compulsory purchases, a high estimate might reduce the amount of development charge payable, yet might result in payment of higher death duties. Owners are naturally extremely wary of making any commitments which might have unforeseen effects as a

result of future legislation or development affecting their property.

The confused state of the administration of the law with respect to determination of development charges may be judged from the following examples quoted from the *London Daily Telegraph* and *Morning Post* of March 21, 1949.

"an industrialist yesterday gave me these examples of charges which have been demanded:

"£11,500 (development charge) on improvement costing £22,000. When a protest was made to the district valuer, he changed his mind and said he would charge nothing.

"£600 (development charge) on erection of a house costing £1200 for a works manager. When the firm protested, the valuer reduced the charge to £20.

"In many cases extremely high charges are being made. Most are reduced when the developer protests. District valuers, as yet, do not know what they are doing. They are feeling their way."

The use of either Inland Revenue or local valuations for rating purposes as a basis for fixing values under the Act would reduce the estimated development charges substantially and result in unequal burdens of development charges among various house types and locations. The system of valuations for rating purposes in England has been described as chaotic.¹⁵ The Local Government Act, 1948, which transferred the functions of valuation from local authorities to the Inland Revenue Department, is expected to raise assessed values in general and, over a period of years, to provide for greater uniformity in valuation procedures. The complicated system of rent controls in Britain, which affects properties subject to different degrees of control with varying incidence, will provide an important obstacle to any broad improvement in the system of valuations for tax purposes in England.

Individual inequities would also most certainly result from the use of any simple multiplier system for determining valuation. Such methods ignore the importance of varying expense ratios and assume a common building life.¹⁶ The Central Land Board has indicated

¹³ *The Economist*, January 11, 1947 (reprinted in *The Journal of the American Institute of Planners*, Winter 1947, p. 27).

¹⁴ Central Land Board, *Application in England and Wales for Determination of Development Charge Under the Town and Country Planning Act, 1947*, Form D. 1.

¹⁵ J. R. Hicks, U. K. Hicks, and C. E. V. Leser, "The Problems of Valuation for Rating," *Occasional Papers*, VII, *National Institute of Economic and Social Research* (Cambridge University Press, 1944).

¹⁶ Frederic M. Babcock, *The Valuation of Real Estate* (New York: McGraw-Hill, 1932) p. 160.

that Consent and Refusal values shall be based upon "market value" represented by an assumed sale between a willing buyer and a willing seller. Wide variations can be expected in the Consent value on the projected multifamily property cited in Case II, varying with the estimated building life, capitalization rate used and predicted rental returns.

Procedure for determining compensation for depreciation in land values will add to the administrative confusion under the Act. According to the claim form used, the market value of the land on the basis that the Act had not been passed and the market value of that interest restricted by the Act to its present use are both to be calculated by reference to prices current immediately before January 7, 1947.¹⁷ Calculation of the market value of a property as of two or three years previous under certain assumed conditions of restriction may result in a weird assortment of value estimates.

Examination of the possible bases for calculating compensation payments and development charges reveals no uniform, fair and accurate method for determination of the various value estimates required in the law. The chaotic status of valuation procedures and the real obstacles to basic improvement under the British pattern of rent controls bode ill for administration of the Act. The Central Land Board seems to have recognized the uncertainties created by the Act and has issued a series of administrative decisions describing the methods of calculating development charges for various classes of property.¹⁸ Although these informative notes may be helpful to owners in determining when they may be expected to pay a development charge, they do not establish at all what the all important value estimates will be.

Conclusions

Tentative conclusions may be reached regarding the probable effects of the Town and Country Planning Act, 1947, assuming that development charges are assessed on the basis of the difference between Consent and Refusal values and assuming that the global fund is maintained at £300 million. Unforeseen administrative policies may alter in substantial degree the actual effects of the law.

¹⁷ Central Land Board, *Claim for a Payment in Respect of Depreciation of Land Values under Section 58 of the Town and Country Planning Act, 1947*, Form S 1.

¹⁸ Central Land Board, *Practice Notes*, First Series, Part III.

1. Private development of land will probably be discouraged.
2. Under conditions of active housing demand, the imposition of development charges will probably result in higher market prices for land and higher housing prices for private development.
3. The law is prejudicial to the financial interests of the owner of undeveloped land as compared with the owner of land already developed.
4. Private owners holding property well adapted to conversion will benefit from rising prices for such properties.
5. Owners of land subject to probable public acquisition will be subject to unfavorable financial consequences.
6. Public development of land will be facilitated through lower land costs under compulsory acquisition.
7. The imposition of development charges on industrial land development will add to costs and consumer prices.
8. Variation in valuations and charges among districts will have substantial effect upon geographical patterns of building.
9. Strong political pressure can be foreseen in favor of increasing the amount of the global fund and raising the estimates of refusal values, thus permitting higher payments for compensation and reducing development charges.
10. Current tendencies in the market for land prices to rise without regard to the Act will probably continue and result in lower development charges, since the latter are calculated as the difference between consent and refusal values.

The objectives of the Town and Country Planning Act of 1947 are attractive to planners and others conscious of the need for proper planning of land use. Land development in England has already become almost exclusively a public function. This Act together with other recent legislation appears to administer the coup de grace to private initiative in land development in England. The author concludes from this examination of the Act that it will result in tremendous administrative costs, confusion and probable injustices on a wide scale.

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Mr. Hewes, Jr., on Land Tenure in Japan: A Reply

THE purposes of Mr. Hewes' article "On The Current Readjustment Of Land Tenure In Japan"¹ are, as the author stated, "to describe briefly some salient features of this system [presumably the new system as a result of the readjustment], in order to indicate the manner in which it became widespread in Japan; as well as some of its effects on the social, political, and economic life of Japanese farmers."² But when the article is read through, one is left with the impression that Mr. Hewes devoted almost the whole article to the descriptive purposes to the neglect of an appraisal of the effects of the land reform program on the life of the Japanese farmers, in which readers may be more interested than in the historical facts and descriptive data.

Mr. Hewes states in his conclusion that "a minimum of 2.7 million cultivators have acquired land as owners under the reform program."³ What does this figure mean economically and politically? Does it mean that these new tenant owners will be able to enjoy a higher standard of living than before the reform? If so, how much higher in terms of real income? Will the reform result in a greater agricultural production in Japan? The author left these important questions unanswered or inadequately answered, although, according to his introduction, they ought to be given considerable attention.

I shall not attempt to analyze these questions here in detail. There are, however, some indications that these new tenant owners can not raise their standard of living as much as one may imagine.

Mr. Hewes mentioned that, "in terms of land in paddy fields alone, about 55 million bushels of rice which formerly went to landlords are now retained by the new tenant owners."⁴ If we take an average, (55 million bushels divided by 2.7 million families) it may be interpreted as meaning that each family of new tenant owners may increase its annual income by about 20 bushels. If we take the average number of members in the families to be 6.5,⁵ the real income per capita may increase by three bushels per year. Against

this, however, we must put the installment and interest which the new tenant owner is supposed to pay for the land title. We must also take into consideration that the new tenant owner may spend fewer days in supplementary occupations than he would if he remained a tenant.⁶

According to a family budget survey for 1936 by the Japanese government⁷ the budgets of 84 owners and 86 tenants in 1936 were as follows:

BUDGET INVESTIGATIONS OF JAPANESE FARMERS' FAMILIES, 1936

	Owners	Tenants
Number of families investigated.....	84	86
Average members per family.....	6.49	6.49
Of which working (able-bodied units)	3.01	2.99
Area cultivated (acres)		
Owned.....	3.02	.20
Rented.....	.12	2.82
Total.....	3.14	3.02
Net income from agriculture (yen)*	849	574
Net income from subsidiary jobs.....	130	150
Net domestic income.....	51	52
Total net income.....	1030	777

* Average annual rate of exchange in 1936, 1 yen = 29 cents.

Though the samples are too small for drawing any general, reliable conclusion, this survey may indicate the comparative advantages of the owner-cultivators and the tenants because such conditions as working force, areas cultivated, and the localities are almost equal for the two classes. The area cultivated here is a little larger than the average farm in Japan.⁸ Therefore our table may be interpreted as indicating that the new tenant owner may, as a result of the reform, have 30% more real income than before. But from the increased income, as has been mentioned, we must subtract the annual installments and interest which the new tenant owner must pay. The betterment of the former tenant's life is consequently not so much as it appears at the first sight. More precise comparison, however, must be left to further investigation.

¹ In 1940 the average owner-cultivator of 1.22-2.45 acres spent 28 days whereas the average tenant of the same sized farms spent 64.7 days. See *Farm Tenancy in Japan*, S.C.A.P., p. 53.

² Cf., Table 55, *Civil Affairs Handbook*, Headquarters, Army Services Forces, p. 157. Our table here was compiled from that table.

³ The average size of farms was 2.7 acres in 1938, Cf., Table 1, *Farm Tenancy in Japan*, p. 47.

¹ This journal, August 1949, p. 244.

² *Ibid.*, p. 244.

³ *Ibid.*, p. 258.

⁴ *Ibid.*, p. 256.

⁵ As shown in the table.

It is difficult to estimate the effect of change of ownership upon agricultural production. Nevertheless, in view of the already extremely intensive cultivation in Japan before the reform, probably no material increase of production can be expected on this account, although the share of the former tenants increases considerably.

Mr. Hewes might be over-optimistic when he said: "The emphatic response of the entire farm population to the opportunity of sharing in the operation of the program speaks well for the inherent capacity of Japanese farmers to govern themselves and to participate in national affairs." It is highly questionable whether this program could have been carried out so smoothly had it not been for the influence of the S.C.A.P. Everybody knows that

the S.C.A.P. amounts to a super government in Japan. The function of the Japanese government since the surrender has been to carry out the directives of the S.C.A.P. The seemingly democratic practices thus far are from top to bottom rather than the other way around. Most of the high officials of the present Japanese government come from the old parties. They belong to the vested interests in the sense that they are connected with the monopoly companies, or they were the landlords. So long as these people remain in power and a great portion of the people remain illiterate, democracy will be in a precarious position as soon as the S.C.A.P. withdraws.

FRANKLIN CHIA

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Book Reviews



The Port of New York Authority. By Erwin Wilkie Bard. New York: Columbia University Press, 1942. pp. x, 352. \$3.50.

A Study of The Port of New York Authority. By Frederick L. Bird. New York: Dun & Bradstreet, Inc., 1949. pp. 191. \$5.00.

These two studies of America's pioneer and premier regional government agency functioning under the Compact Clause of the Federal Constitution admirably complement each other. Dr. Bard's earlier study is written from the standpoint of a political scientist; Dr. Bird's study is primarily from the financial expert's point of view.

Dr. Bard has written an objective, scholarly history and appraisal of the Port Authority; he has written as a political scientist interested in regionalism and public administration. His book expressly takes the form of "institutional biography," following a pattern pioneered by Gaus and Wolcott in their study of the U. S. Department of Agriculture.

Dr. Bird's study was made at the request of the Port Authority (and at least partly financed by the Authority). Being written primarily from the financial point of view, it gives a very considerable amount of earnings and financial data that are omitted or only summarized in Dr. Bard's study and is, of course, more up to date since its more recent publication enables inclusion of postwar earnings and experience.

The chief conclusion emerging from these two studies is this. Without the use of the general taxing power or substantial use of government credit, it is possible, by hard work and skillful debt administration, to develop gradually a largely autonomous, regional government agency at the state level—virtually an interstate "public corporation"—for both planning and also building and operating self-sustaining public works, which is competently administered, flexibly

financed, and now enjoys a good credit reputation and earning power. On the other hand, this result could probably not have been reached without immunity from taxation and price regulation, and virtually 100% debt financing after the first steps.

To build this enterprise and this reputation has not been easy. Dr. Bard traces in some detail how the Compact between the states of New York and New Jersey emerged in 1921 from long years of interstate and inter-railroad rivalry in the use of the port. During this period various shippers, business and federal government organizations in varying degrees sought to get some coordination and cooperation out of chaotic competition. Even after the Compact was made and the Comprehensive Plan, based largely on the pre-Compact report of the Port and Harbor Development Commission, had been adopted by the Authority in 1922, efforts to unify and coordinate terminal facilities were abortive. The state legislatures had given insufficient coercive powers to the Port Authority, the railroads refused to cooperate, and the Interstate Commerce Commission or other federal agencies lacked power or desire to aid these efforts. Dr. Bard describes how the Authority tried the methods of coercion, persuasion, and public acquisition, without appreciable success, and finally adopted the policy of building government-owned facilities. The only major accomplishment among the terminal unification proposals in the Comprehensive Plan was the building of a union inland freight terminal for I.C.I. freight in midtown Manhattan in 1932.

In the building of bridges and tunnels, and now in the motor truck and bus terminal program, the Port Authority so far has had much greater success. In this field the Authority has made its greatest financial accomplishment and contribution. It is too early to tell yet whether the motor truck and bus terminal program will turn out successfully soon or ultimately, as anticipated. Especially is it too early yet to determine whether equally commendable results will be achieved in the Port Authority's newest

projects—coordinated development of airport terminals and rehabilitation of marine terminals, piers, and related facilities.

It is generally recognized that the Authority has done an outstanding job financially. This has been told in clear and able style both by Dr. Bard up to 1942 and by Dr. Bird to 1948. The Authority, virtually by its own bootstraps, has built a business with nearly \$300 millions of assets at the end of 1947 and over \$21 millions of income available for interest, sinking funds and reserves—all in about 25 years. True, the Authority has been materially helped by the "cheap money" policies of the federal government and exemption from federal and state income and property taxes. The Authority has done this building virtually by its own bootstraps because the Authority has no taxing power as such and its only "equity capital," apart from small federal grants, was an advance of about \$18 millions of state funds (actually only \$17.5 millions were paid in (Bard, p. 237), early in its expansion stage, since then partly repaid and partly converted into a capital contribution. In addition, the Authority reaped the benefit of the net earnings of the Holland Tunnel, above debt service charges, when it acquired the tunnel upon issuance of \$50 millions of Authority bonds (approximately the cost of constructing the tunnel by state funds provided to the predecessor Tunnel Commission).

The chief financial devices used were: (1) the pooling of revenues from all facility operations through the establishment of a General Reserve Fund, in addition to any special reserve funds, the operations of this General Reserve Fund being surrounded by certain fairly stringent restrictions for the protection of bond purchasers, and (2) large use of term, rather than serial, maturities, accompanied, however, by a liberal policy of accelerated debt retirement. Both authors, but especially Dr. Bird, give a full account of the provisions and operations of this Fund and the special reserve funds. The General Reserve Fund was authorized by concurrent legislation of New York and New Jersey in 1931; these statutes required pooling of revenues and the establishment and maintenance of a general Reserve Fund of 10% of the outstanding obligations backed by this Fund. It was about this same time that the respective state legislatures authorized turning over Holland Tunnel, then recently completed,

to the Port Authority. This gave it some earning power. In 1935, in initiating a refunding program at a very strategic time financially, and further in 1947, the Authority, by resolution, covenanted for the further protection of bondholders by tightening the rules governing administration of this Fund, specifying minimum balances of two years' debt service, spelling out permissible uses of Fund balances, restricting extension of pledging of revenues and the Fund only to those new facilities with established minimum earning power, and in other ways.

One of the most interesting sections of Dr. Bird's study is the group of chapters describing the Port Authority's newly acquired responsibility for the development of air terminals in the New York region (Chapters XII-XV, inclusive). This, of course, came after Dr. Bard's study was published. Earnings-wise, this new program seems more marginal. Its financial success hinges very largely on the reasonableness of the revenue forecasts; but its scope and reach challenge imagination and show the Authority in a forward-planning role. One hopes that these revenue forecasts prove more realistic than the over-optimistic Staten Island bridge traffic estimates made originally by the Authority (See Bard, pp. 248-9). The Authority now wisely uses independent consulting engineers for making or reviewing its forecasts.

Comparing the two studies, it is interesting not only to contrast their different approaches but also to note a difference in quality. Dr. Bard writes from the critical scholar's point of view. Dr. Bird has written almost fulsomely about the financial features, policies, and accomplishments of the Authority. His study illustrates the necessity, even for an established government agency, especially when facing further capital financing, to inform investors by issuing a brochure designed to build investors' confidence in the security issues of the agency. Each kind of study has its place but the differences should be kept in mind.

Certain features of the Authority's experience, to the reviewer's mind, warrant brief mention for those interested in public utilities, especially utility finance, depreciation, and rate-making and the government vs. private ownership controversy. In the short space of a review, these features can only be listed, not discussed.

1. A good credit reputation can be built

up only gradually as earning power and earnings coverage are demonstrated and, in the case of self-sustaining government projects financed by debt issues, as reserve funds, conservatively administered, are built up.

2. Immunity from federal and state income taxes and all property taxes, and exemption of interest paid on debt issues from federal income taxation of the holder of such securities to the same extent as municipal and state bonds (Bird, pp. 38-9) are indispensable aids in selling such bonds and reducing interest costs. Regulated privately-owned public utilities do not have this tax advantage, a substantial one at present tax rates.

3. Untrammelled power for the Authority to fix tolls or prices, without outside regulation, was also found indispensable in financing. Regulated public utilities do not, of course, have this privilege.

4. A common stock equity or its equivalent, in capital or earnings or both, is indispensable in successful capital financing. The Authority needed initially a 25% "common stock equity equivalent," in the form of state advances, in order to sell bonds for the Arthur Kill, George Washington, and Bayonne bridges. These were "junior loans" of state funds, subject to an annual 2% sinking fund and 4% interest on unpaid balances. Of the total of \$17.5 millions so advanced at different times, some of these advances were compromised later and repaid by issuance of refunding bonds in principal amount of only five-ninths the original principal amount (Bard, pp. 261-2). Hence there were also substantial "capital contributions," including in addition some federal "grants-in-aid." This shows the importance to bond buyers as well as other investors of having a substantial equity (or earnings) cover for bonds, including "government corporation" bonds, when they are not backed by the taxing power, even though unrestricted toll- or price-making power was granted and this might be deemed a taxing power equivalent.

5. Liberal debt retirement is a necessary equivalent to a common stock equity and dividends thereon in building superior credit and attracting new capital, even under government auspices. In the case of the Authority this debt retirement program is being carried out through the General Reserve Fund and special sinking funds, supplemented by accelerated debt retirement from surplus earnings above appropriations to reserves.

6. After bonds are retired, however, there are no continuing requirements for payments into state or municipal treasuries, equivalent to a steady dividend policy. All net earnings are ploughed back.

7. There is a complete absence of depreciation accounting, though Dr. Bird notes (p. 71) that studies of the need for some depreciation provisions are now under way as a general guide to debt retirement policy. Apparently the debt retirement program and requirements, plus maintenance, are deemed a complete offset to depreciation, despite the payment of debt retirement funds back to investors and hence "out of the business." Presumably renewals of parts of facilities, whether "retirement units" or not, are charged to current maintenance expense. Whether the nature of the property to be owned by the Authority in the air and marine terminal projects will require a larger proportion of early property retirements or renewals, in relation to debt retirements, and hence require some systematic depreciation provisions is a question not discussed but worth raising.

I recite these features of the Authority's experience for two chief reasons. First, they help to explain the improvement in debt service coverage ratios which statistically measure the Authority's growing financial success or prospects (See Bird, pp. 64, 81, 177, 180-181). Second, they serve as warning signs against possible misinterpretations of the Authority's experience by too zealous advocates of further extensions of government ownership of public utilities of all kinds. Such advocates might be tempted to use the success-story of the Port Authority as arguments for their "cause," without recognition of special circumstances and limiting factors. Indeed, it is interesting to speculate whether the Authority, with its present toll rates and complete control thereof, could have financed its projects at all by public security issues and, if so, at what interest costs, had it been obliged to assume (1) full taxes or tax equivalents, (2) price or toll regulation by an independent agency, (3) provision of a full 25% "equity" capital cushion by public sale of securities and payment thereon of a "dividend equivalent" sufficient to attract such junior capital to the enterprise.

The financial success of the Port Authority has been well earned, as these two able chroniclers so well record from their respec-

tive points of view. This success was not without costs when compared with other public utility operations. The special reasons for this success, and the prices paid for it, deserve remembering wherever the enterprise is sought to be duplicated.

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Zoning Law and Practice. By E. C. Yokley. Charlottesville: The Michie Co., 1948. pp. xviii, 514. \$10.00.

The Law of Zoning and Planning (Second Edition). By Charles A. Rathkopf, assisted by Arden H. Rathkopf. New York: The Grosby Press, 1949. pp. xii, 667. \$15.

A decade and a world war have intervened between the publication of this volume and legal treatises on zoning by Smith and by Rathkopf. Rereading my comments on those works in *this journal* for August 1938, I find it hard to frame a significantly different statement about this book. Yokley claims that the intervening decade has been one of great advance in zoning law, but this advance is not reflected in the art of treatise-writing.

Yokley professes to keep in mind the needs of the city attorney who must defend the ordinance, instead of providing ammunition only to the sharpshooter. He includes not only forms of instruments used to contest the validity of the ordinance, but also a form of application for a permit and of a certificate of occupancy. These are advances over both Smith and Rathkopf. But we have in Yokley the same hornbook array of incontestable and opposing maxims, the thundering generalizations in which the court cloaks its decision to support or invalidate the application of the ordinance, with a jumble of paragraph summaries of fact-situations to illustrate the principle, say, that "the ordinance must not be arbitrary."

Everything is of equal weight in this sort of agglomeration. The *Mansfield* case in New Jersey—one of the few where the judge looked beyond the complainant's lot and recognized the ordinance as a tool to support the comprehensive planning of the future of

the community—is worth just another footnote citation. Casually, it appears that "in Massachusetts it has recently been held that esthetic considerations are entitled to some weight . . ." with no reference to the classic statement in *Perlmutter v. Greene* and no evidence of awareness that here is a significant extension of the scope of the police power. Yokley at least has a fine passion against spot zoning. It is not easy to find whether he has anything to say about court decisions on minimum-lot sizes.

Mr. Yokley, now first assistant city attorney of Nashville, has served in that office for over a decade. Friends have encouraged him to expand some notes on Tennessee zoning cases into a general treatise which he has dictated in the interstices of a heavy work-load. (It is perhaps the secretary's fault that names such as those of Baron Haussmann, Mr. Justice Field, and Secretary Ray Lyman Wilbur are misspelled.) A bit of history is thrown into the first chapter. (Haussmann's boulevards of the Second Empire are offered as evidence of the early prevalence of zoning in European cities.) Perhaps the most instructive thing about treatises like these is the picture we are able to construct from them of the men into whose hands the planner must entrust his work for legal protection: earnest, conscientious, overworked, but evidencing little comprehensive understanding of what the planner is trying to do.

At the same time Rathkopf has issued a second edition of his 1937 work, so revised and enlarged as to make it much the best reference work of its type. The text has been expanded from 140 to 480 pages and the citation of cases covers the nation, instead of New York alone. The original frame-work has been preserved, so that zoning is still presented as parallel to and distinct from planning, not as an exercise of the police power to implement a plan. The application of this tool to control bulk and height is still presented as a recent excrescence, somewhat heterodox.

Apparently the type of labor involved in collecting and cataloging thousands of cases militates against reflecting upon their significance. Cases on density of population as a limitation are slipped into a section on minimum lot sizes without making clear that in some the court was not discussing constitutionality but only the failure of the enabling act to authorize the use of this test. The legal forms presented are still solely those

useful in attacking an ordinance (including, inexplicably, a form of motion for change of venue to another county, hardly an issue in zoning law). But here at least is the most convenient collection of the largest number of cases among which a thoughtful reader is free to try to pick his way.

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Agriculture and Industrialization. By Pei-kang Chang. Cambridge: Harvard University Press, 1949. pp. vii, 270. \$5.00.

This is an analysis of the process of industrialization of a country, particularly with respect to adjustments in agriculture. Four major questions are discussed: (1) Is industrialization a necessary or sufficient condition for agricultural reform? (2) Can a balance be maintained between agriculture and industry in a given country? (3) Can mutually beneficial relations be maintained between agricultural and industrial countries? (4) What problems confront an agricultural country during the industrialization process?

With misgivings about the adequacy of available theory, Chang develops a scheme of analysis for an evolutionary process of industrialization. Industrialization is defined (p. 66) as "... a process in which changes of a series of strategical production functions are taking place." These "strategical" functions generate changes in other functions.

Five factors account for industrial evolution: population, resources, institutions, technology, entrepreneurship. The last two are classed as generating factors and the others as limitational. Chang follows Sombart in emphasizing the primary importance of the "enterprising spirit." He points out the absence of this spirit in Chinese tradition. Discussion of limitational factors stresses the dynamic aspects—the ways in which technology continually revises the limitations imposed by population and resources.

With respect to effects of industrialization on agriculture, Chang takes the position that industrial development is essential to widespread technological improvement in agriculture because it tends to raise the price of

farm produce and to make labor more costly. Industrialization, however, can not bring about agricultural reform by itself. It must be accompanied by consolidation of farms and adjustments in legal and other institutions. Chang considers it impossible to conceive of any balance except in a theoretical sense between agriculture and industry because, in the process of industrialization, the expansion of industry is indefinite while that of agriculture is limited. In the later stages of industrialization the relative importance of agriculture in the economy must decline. There can be mutually beneficial relations between industrializing and highly industrialized nations. The extent to which the latter will benefit will depend upon adjustments made to meet increasing competition in some lines of production.

Problems confronting an agricultural country during industrialization are discussed with specific reference to China. They are: inadequate protection of domestic industries; interregional barriers to trade and poor transportation facilities; small farms and unfavorable tenure systems; and need for importation of capital.

Agriculture and Industrialization was awarded Harvard's Wells prize for 1946-47. It is a significant attempt at systematic exploration of a subject that has not received adequate attention from economists or economic historians. Presentation of the principal arguments would be more clear if less attention had been given to side-issues. Occasional statements are open to question. The idea (p. 35) that "... farm technology always goes side by side with industrial development" hardly squares with the lack of technological progress in English agriculture in the past 60 or 70 years. Use of the principle of acceleration to explain the relationship between changes in agricultural and industrial prices (p. 37) can be questioned. The discussion of effect of introducing a technological improvement on the farm (p. 120, Figs. 3 & 4) involves an error with respect to costs.

Other minor criticisms could be made, but Chang's major conclusions seem carefully reasoned and well documented. He has perhaps placed too much emphasis upon the necessity for industrialization to begin in advance of agricultural reform.

ORLIN J. SCOVILLE

Bureau of Agricultural Economics

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